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Feudal Splendor Lingers in Rajputana

By Volkmar Wentzel

With Illustrations from Photographs by the Author

In the oases of the Indian Desert and in the uplands of India's ancient Aravalli Range knighthood still flowers. There the resplendent maharajas of Rajputana, descendants of a lusty warrior race, dwell yet in the Age of Chivalry, surrounded by lavish Oriental pomp and circumstance—which their high-speed planes, air-cooling systems, hydroelectric projects, and foreign educations cannot dim.

I traveled the length and breadth of five of the 23 Indian States, which, together with a Chiefship and a small Estate, made up the former Agency of Rajputana, now a part of the new Dominion of India.

The journey was one phase of my general staff assignment to make a pictorial survey of India for the National Geographic Magazine. Most of the trip was made in a war-surplus United States Army ambulance, purchased and converted into a National Geographic Society mobile headquarters, photographic supply house, and hotel (page 421).

I met people in all walks of life—ruling class, landholding Rajputs; priestly Brahmans; devout and business-minded Jains; Jats and Gujars, humble villagers who tilled the soil; *sadhus*, ascetic holy men—the great majority of them Hindus.

I also met a generous number of Englishmen—diplomats, soldiers, and businessmen—many of whom had been born in India.

My most lasting impressions of Rajputana are of the incomparable pageantry and splendor in the courts and palaces of the maharajas. How long this way of life will continue, now that the Indian States have been fused into the Dominion, is problematical. Already many changes have been made.*

Rajputana, somewhat smaller than Missouri and Oklahoma combined, has a population of nearly 14,000,000.

On the west it borders Sind, part of the new Moslem Dominion of Pakistan. To the north lie the strife-torn Punjab and its States. For 150 miles in the east the Chambal River forms its border. On the south a very irregular boundary line cuts it off from the central region of India (map, page 417).

From southwest to northeast the Aravalli Range intersects Rajputana. The area northwest of the mountains forms part of the Indian (Thar) Desert—sandy, unproductive terrain punctuated with oases. To the southeast lie fertile lands where fuel and fodder abound.

Changes Affect Maharajas

Rajput maharajas reign over their States with inherited authority, although many voluntarily are giving up their autocratic powers. Since my visit most of Rajputana east of the mountains has been merged into a new administrative unit called Rajasthan. Representatives of the maharajas have seats in the Indian Government at New Delhi, just a few miles northeast of their States.†

The new Dominion Government affects a maharaja in three ways: It is responsible for

* See, in the National Geographic Magazine: "India—Yesterday, Today, and Tomorrow," by Lord Halifax, October, 1943; "In the Realms of the Maharajas," by Lawrence Copley Thaw and Margaret S. Thaw, December, 1940; and "Life with an Indian Prince," by John and Frank Craighead, February, 1941.

† See "Delhi, Capital of a New Dominion," by Phillips Talbot, National Geographic Magazine for November, 1947.

A. L. Byrd

Slave Girls Once Lolled Beside the Cooling Fountains of This Udaipur Garden

Now village women, chuddars (Indian shawls) draped over their shoulders, enjoy its beauty. Water for the playing streams, partially obscuring the stone fountain in the center of the pool, comes from a near-by lake.

the defense of his State against external aggression; it conducts the foreign affairs of his State; and it is responsible for the Dominion's system of communications, which link the States. Otherwise, a maharaja remains the arbiter of his subjects' destinies.

An Indian Journey Begins

About a year and a half ago I landed in Bombay in the middle of India's hot, murky monsoon season, to find myself adrift in a strange sea of humanity.

My first problem was to find transportation for myself and my heavy photographic equipment. Ever since my Army days on Okinawa I had felt that a standard U. S. Army ambulance would make an excellent vehicle for a photographer, particularly over a vast subcontinent like India. Front-wheel drive for difficult terrain; rugged engine, spring, and body construction; stretchers for sleeping; solid top to support a man and tripod—all recommended it.

I knew there were ambulances among the United States war surplus material left in India. The United States had sold all surplus equipment to the Indian Government, which was disposing of it in wholesale lots. I was told to go to New Delhi, India's capital.

So I acquired a bearer, Akbar Ali, a Mohammedan lad who insisted on wearing a heavy Angora cap on the hottest days, but who otherwise was most efficient.

With his aid I loaded my 14 cases of equipment into two dilapidated victorias and we galloped off to the station to catch the Frontier Mail. The heat was intense, and I was delighted to find that Ali had reserved for me an air-conditioned compartment which I was to share with a pleasant-faced Indian Government official.

The next evening we completed the 1,000-mile trip to Delhi, which turned out to be hotter and more uncomfortable than Bombay. I found rooms in the Cecil Hotel. Its home-like atmosphere, good meals, and swimming pool made it a haven for me to return to throughout my travels in India.

I didn't get an ambulance in Delhi. They all had been sold. By good luck I learned some still were available in Calcutta. I boarded an airplane for Calcutta; Ali and my equipment stayed behind.

The plane was a converted C-47, flown by an Indian pilot and staffed by lovely Indian air hostesses. Instead of the chewing gum which airline hostesses in the United States bestow upon passengers, they passed out from time to time cloves, nuts, and spices from south India.

After hours of weary search for an ambulance in Calcutta, I was about to give up in despair. The huge Government supply yard there covered acre after acre. Through it I wandered all day in the oppressive heat, but I could find only wrecked ambulances. The next morning, none too hopeful, I returned to the hunt and by chance came upon Capt. R. S. Ram, a young Indian officer in charge of one section of the yard. I told him my oft-repeated story. His face brightened.

"My father is a member of the National Geographic Society," he said. "How can I become a member?"

"Get me an ambulance and you are as good as in," I told him quickly.

Captain Ram has been a member of our Society now for more than a year.

Overland Drive to Delhi

My ambulance was a good one. The speedometer showed only 18,000 miles, most of it acquired in wartime service along the Stilwell Road in Assam. I had it overhauled and obtained gasoline ration coupons, driver's permit, and registration card. Then I left Calcutta for Delhi, which I reached in four days.

In Delhi, aided by mechanics, carpenters, and a sign painter, I altered the ambulance to suit my purposes. Then I made my first photographic trip, to the northern State of Kashmir,* unaware of the exciting adventures in store for me in Rajputana. On my return to Delhi I made friends with James Billman, then United States vice consul, and Frederick Vock, representative of a Swiss firm.

As Christmas Day neared we attended a round of parties. At one of these I met His Highness the Maharao Raja of Bundi, who invited me to spend Christmas as his guest, and the Maharaja of Jaipur suggested that I stop off to see him at his palace, en route through Jaipur to Bundi. I accepted both invitations with alacrity.

Jaipur, capital of the Indian State of that name, is a fabulous rose-pink city southwest of Delhi. Thus far the State has not been absorbed in any new political alignment.

Its Maharaja's unusual attainments embrace more than his great wealth, social position, and English education. He is one of the world's best polo players. His stables house more than 200 superb ponies. Electric fans and shower baths keep his mounts cool. He also pilots his own converted C-47.

The State of Jaipur lies on a barren, sandy plain northeast of the Aravalli Range. It is a little larger than Massachusetts, Rhode Island,

* See, in the NATIONAL GEOGRAPHIC, "The Idylic Vale of Kashmir," by Volkmar Wentzel, April, 1949.

Indians, Young and Old, Thrill to the Notes of a Street Musician's Sitar

They halt outside a gaily decorated bazaar in Bundi to hear a performance on this popular Indian stringed instrument. The modern mural at left shows how Rajputana has accepted the airplane without discarding the elephant.

and Connecticut combined, and has a population of 3,040,000. Jaipur city, built on an oasis, is about 180 miles southwest of Delhi.

Jim, Fred, and I set out on our journey in the ambulance on the afternoon of December 22 and drove without incident for about three hours. The road, through the sandy cactus-clad waste, was virtually deserted. Then, about dusk, the ambulance suddenly shook and stopped. We tried vainly for several hours to find the cause of the trouble. Night settled down.

Panther Stares in the Dark

Finally we saw a car's headlights in the distance. As it drew near we hailed the driver. By sheer luck he turned out to be a wealthy Jaipur polo player with whom Fred was acquainted. As soon as he heard we were guests of the State, he gave a quiet command to his servant. The man disappeared and, almost instantly, reappeared beside us with a tray bearing cool refreshments.

I rubbed my eyes at this genielike performance.

Even as we were thanking him, we received another and not so pleasant surprise. A panther (leopard) appeared at the roadside, not 50 yards from us, eyes aglow in the gathering dusk. The servant produced a gun even more quickly than he had fetched the drinks. The polo player shot and missed, and the panther vanished.

Eventually we were able to start the car. We thanked our friend and drove on 100 miles. Then the motor again conked out.

Now we were stalled in a piece of Jaipur's best tiger country. Jim's active imagination conjured up tales of man-eaters, and when we heard something prowling in a near-by thicket it did not improve our nerves. One of us kept watch with a flashlight while the other two worked. But no tiger put in an appearance. We finally located our difficulty in the ignition system, repaired it, and by midnight limped up to the gates of Jaipur.

"Why Should We Fight, Jumbo? Let's Be Friends"

This staged elephant duel in a Jaipur courtyard fizzled out when the two beasts refused to become combative. Attendants prodded them with sticks and set off firecrackers to arouse them, but the only result was a mild butting match which ended in a few moments with no injury to either participant (page 429).

But Jaipur is a completely walled city. All the inhabitants seemed to have gone to bed, and all the gates—large and cumbersome, with anti-elephant spikes sticking through them—were locked.

We reconnoitered and found a small passageway, the gate to which was ajar. We pushed through and then, from inside, unbolted the medieval gates and, using all our strength, pushed them open.

We drove down the dark street, marveling at its width. We later learned that Jaipur, one of the finest of Indian capitals, is also one of the few Oriental cities built on a regular plan, its broad streets bisecting each other at right angles.

After we had gone a few blocks, we could see an illuminated fountain and we headed for that. Sure enough, this striking work in Lalique glass stood at the entrance to Rambagh Palace grounds, our destination.

There on the marble steps of the palace, an aide-de-camp of the Maharaja, who responded to the nickname of "Rabbit," welcomed us like long-lost friends despite the lateness of the hour. Overlooking our bedraggled appearance—we resembled three automobile mechanics at the end of a busy day in the shop—he ushered us into the palace. Grimy and unkempt, we stepped right into a page from the *Arabian Nights*.

The Maharani Receives Us

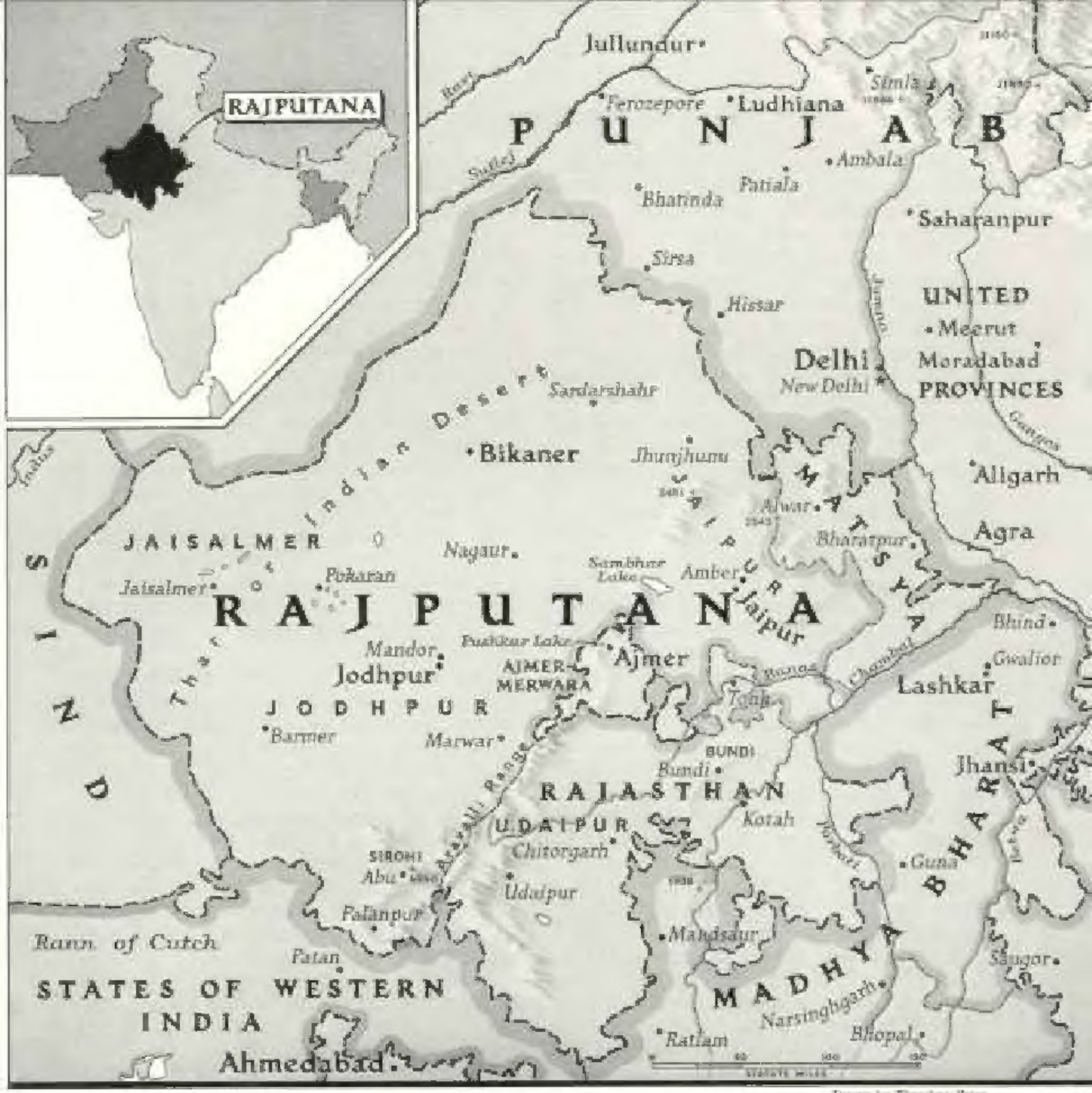
The room which we entered was brilliantly lighted and lavishly decorated with Oriental rugs, Chinese tapestries, and other rich and exotic furnishings. In the center of the room on a couch sat Her Highness, Shri Maharani Sahiba, beautifully gowned, and surrounded by sari-clad feminine friends and attendants seated on hassocks (page 445).

They were amusing themselves by playing records on a small portable phonograph.

The Maharani saw us and motioned to one of the turbaned servants in the background. As quickly as the contractor's servant in the

Death Awaits the Tiger in the Moat when He Emerges to Meet His Antagonist

Spectators line the walls in Jaipur's zoo. When the newly captured man-eater, now pacing along the edge of the moat, was released in the enclosure, the other captive tiger jumped into the water. A few moments later he climbed out to do battle and was killed (page 429).



Drawn by Theodore Price

Rajputana's 23 Indian States Spread over Desert, Mountain, and Jungle

Total area is smaller than that of Oklahoma and Missouri combined. In the desert oases and on fertile uplands dwell some 14,000,000 people. Although its summers are exceedingly hot, Rajputana is one of the most healthful sections in the new Dominion of India. Today many of the Rajput States are being absorbed in new administrative units of the Dominion. Light gray of inset shows India; dark gray, Pakistan.

desert, he vanished and reappeared with a tray filled with refreshments. Graciously the Maharani received us and showed deep interest in the story of our misadventures en route to Jaipur. At length we were escorted to our quarters.

My room was huge and appointed with Western furnishings, including an ultra-modern electric fireplace. I noticed an assortment of familiar-looking gear in one corner of the room and walked over to investigate. A light dawned on me. "Rabbit" had ordered the servants to "bring in all the things." They had taken him literally, had removed everything from the ambulance that was not nailed down, and had faithfully deposited it in my room—down to and including the spare tire.

The next morning after breakfast we met Ram Gopal, Leela, and other members of a famous Indian dancing troupe on one of the palace verandas. The air was balmy and conversation lively. All too soon I had to take my departure for Bundi, leaving my friends Jim and Fred behind. But His Highness invited me to return after New Year to attend the annual Gangor Festival and also a subsequent round of entertainment he had planned for his festival guests.

The ambulance behaved well on the first leg of my journey southward and there was time to observe my surroundings. Gaily dressed women passed along the roadside, gracefully carrying colorful water jugs atop their heads (page 421). High-wheeled camel- and ox-carts moved slowly along. Here and there farmers worked in their fields, which bobbed up between stretches of sandy waste.

Alas, at sundown the ignition coil burned out, and I found myself stalled in a small mud village, about 85 miles from Bundi and 55 out of Jaipur. I was surrounded by scores of curious villagers, but could talk with none. They were most friendly and offered me food. Not to be outdone, I presented them with Army K rations, which they enjoyed immensely, although the little wooden spoons and the chewing gum puzzled them.

After dark they built a small fire and prepared to stand guard for me during the night, for I could not repair the ambulance. Not a single car had passed in either direction.

Just as I was preparing to sleep on my stretcher, a car did arrive on the way to Jaipur. In it were a Jaipur jewelry merchant and his three sons. They offered me a lift and, leaving the villagers to watch the car, I rode back to Jaipur, making a rather undramatic return to my friends at Rambagh Palace, where I again passed the night.

The next day, with the aid of some Jaipur State mechanics, we replaced the defective part and I renewed my journey.

The road into Bundi became more and more hilly. This small Indian State, 1,500 feet above sea level, is about the size of Delaware and has a population of about 250,000. Its capital rests in a steeply walled valley (page 452).

Bundi Aglean on Christmas Eve

As the ambulance slowly gained the crest of a hill, I saw before me in the valley hundreds of twinkling lights—an unforgettable scene in the dusk of that Christmas Eve.

The illumination was from the Diwali (Festival of Lights) lamps of the Hindus, especially brought out and lighted upon orders of the thoughtful Maharaja to give a Christmas Eve welcome to his Christian guests, chief of whom was Field Marshal Sir Claude Auchinleck.

I stopped the ambulance and began to make a time exposure of this impressive scene. While I was counting off the seconds of the exposure, the Maharaja, showing some of his guests the sights of Bundi, pulled up beside me in an automobile. He recognized the National Geographic Society truck and told me to lose no time in getting to the palace, which lay in the hills several miles beyond the capital, and where dinner awaited us.

The ambulance finally limped into the palace grounds and I was joined by the other guests. Phoolsagar (Lake of Flowers) Palace is a comparatively small building and very old, but it had been stunningly redecorated within during World War II with brilliant murals depicting ancient scenes of knighthood in Rajputana. The artists were German and Italian prisoners of war who had been interned near Bundi during the war.

My sleeping quarters were at the modern State Hotel just outside of the city, so I drove my ambulance back there alone.

On Christmas Day cars came for the Maharaja's guests, and we were taken 40 miles into the jungle to an ancient and abandoned fort, now used as a hunting lodge. The highlight of our holiday entertainment—a tiger hunt—was scheduled.

In a big clearing in front of the lodge stood a tent encampment for the Maharaja and his guests. Each tent was comfortably furnished, and the printed cloth finish on the inside walls gave it a luxurious Oriental effect. About 200 yards distant was the camp of the beaters, mahouts, elephants, and horses.

Just as we had finished luncheon, the chief *shikari*, or head beater, excitedly entered the huge dining tent and said that two tigers had been sighted about an hour before. Quickly the guests, who numbered about twenty, were divided into two groups.

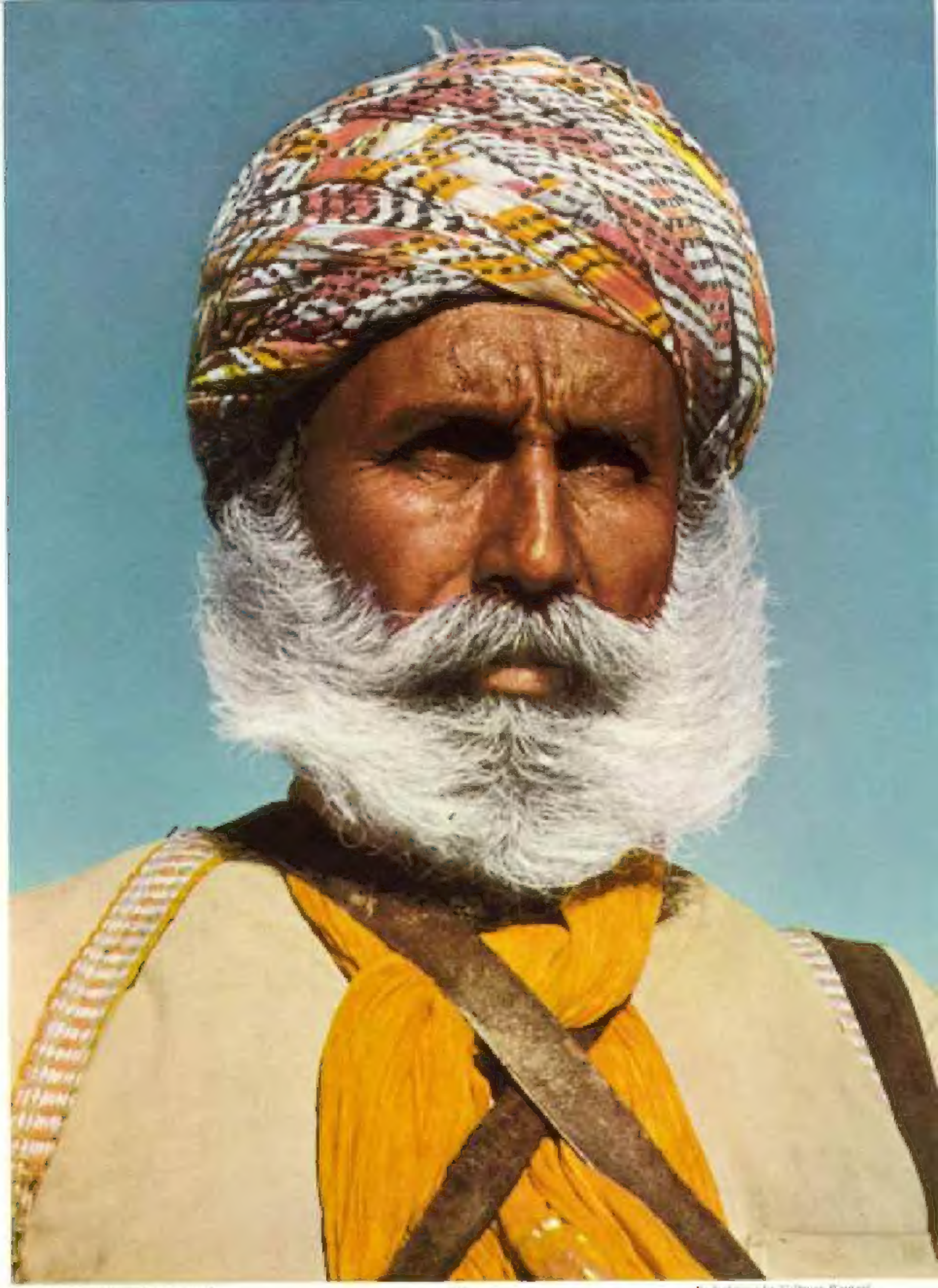
Some, including the Maharaja, his younger brother, Maharaj Kesri Singh, and other Rajputs, ascended to the howdahs of the hunting elephants (page 428).

Others, including myself, were assigned to the *machans*, wooden platforms erected in trees. Here we found guns ready-loaded for us, and a shikari who was to render us any necessary assistance. We were told to be absolutely silent.

Soon in the distance we could hear shouting, whistling, and drumming, which grew louder and louder as the beaters approached us. Suddenly from a machan about 500 yards from us came a shot, followed by a ferocious growl. The tiger had been wounded.

Now the hunt assumed its most dangerous aspect, for it was necessary to finish off the wounded beast, and this was up to the hunters on the elephants.

At a signal from the head shikari the elephants began to surround the piece of jungle where the wounded tiger had taken refuge. The Maharaja's younger brother pressed into the jungle on his beast.



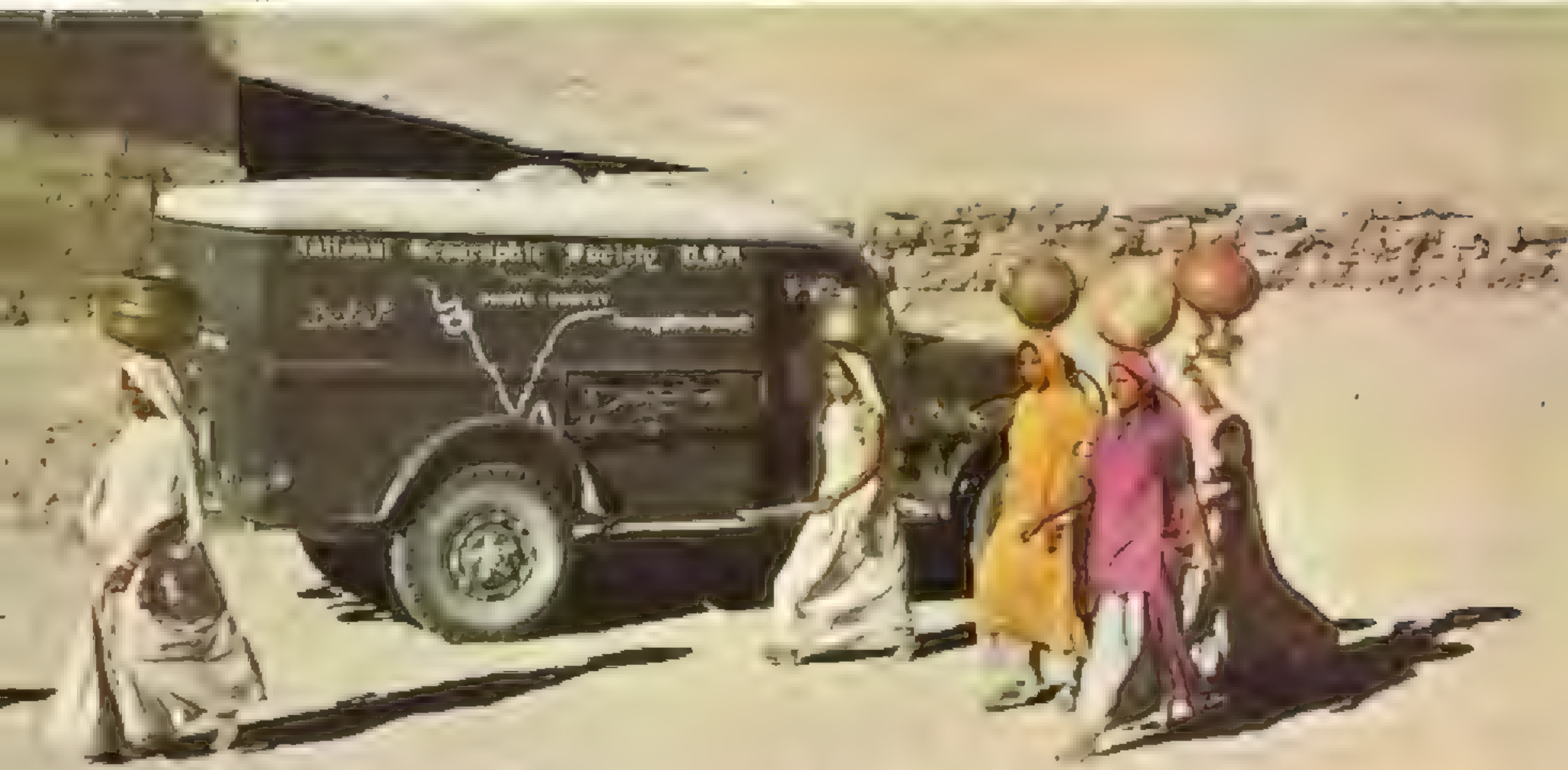
Kodachrome by Volkmar Wentzel

A Rajput Bard, Beard Brushed and Parted, Recites Noble Deeds Like a Viking Skald

From his father, this court poet has learned the genealogy of the royal house of Jaisalmer, one of the States of Rajputana. His sagas glorify the knightly chivalry of the Rajputs, India's aristocratic warrior caste.

Jaisalmer's City Wall Is Besieged by the Implacable Indian Desert — Decaying Homes Reduce Drought's Sufferers

So Scarce Is Water that Housewives March to Milk and Back with Vessels of Brass or Clay on Their Heads



A Prince Princess in Bed in the Palace, perhaps Udaipur, Mewar (Hari Warshing)

▲ A Special Train Awaits the Bridal Couple and Their Guests at Indiana's Station

[illegible]

▼ Handsome Rewards Bridal Attendants March Singly in the Wedding Procession

[illegible]

Behold the Bridegroom! Prince of Jodhpur, Richly Jewelled Rides to Wives House for Jaisalmer

Armed in Medals, Swords and Jewelled Turbans the Soldier of Rajputana Parads on the Wedding Mare

Lamas and Bodhisattvas Guard the Palace, Where the Image is in Peril

Watching closely from my machan, I saw the tiger, which apparently had leaped out of nowhere, on the flank of the young man's elephant, clawing its way upward behind the frightened beast's ear. Quicker than it takes to tell, the rider shot the ferocious animal at close range. It dropped to the ground, examination later showed it was a female about to give birth to five cubs.

Later I had time to wander about the famous pink city of Jaipur. Rambagh Palace is not far from the north gate, but in the heart of the capital stands the ancient City Palace (page 440), surrounded by other State buildings.

Women Observe Purdah

Highest of these is the pink nine-story Hal of the Winds, with a confusing façade of countless small latticed windows, all carving outward from carved stone frames. Here, in days past, women of the Maharaja's zenana, without being seen, could peer down upon the crowds in the streets and view festivals and parades.

All women in the zenana were held in strict purdah, screened and secluded from the eyes of the public. The present Maharani usually observes purdah when she is at the City Palace, in contrast to her freer movements at Rambagh.

All the buildings in the palace grounds are connected by courtyards, passages, and gateways.

Also within the walls is an elephant corral, more than an acre in extent, where in the past several hundred elephants were kept. Now it confines only a few. At one point atop its massive stone wall is a tower from which the maharajas and their guests sit to watch elephant fights below.

Also within the palace grounds stands the largest of the five observatories built by Jai Singh II, philosopher and astronomer of the 18th century and founder of the city.

Like the palace buildings, houses throughout the city are painted rose pink. The wide main street is flanked by scores of these colorful homes, all with balconies and latticed windows. Side streets are crowded with the shops of artisans—workers in gold, silver, stone, brass, and ivory.

In contrast to these ancient surroundings are the modern sewage system, electric lights, and water supply, to a large extent the work of British engineers.

As the time for the Gangor festival approached, an air of expectancy permeated Jaipur. This ancient rite is held in honor of Gauri, the goddess of abundance.

In accordance with the wishes of the Maharaja, tradition is strictly observed in the Gangor Festival. His only concession to modern ways is in his attire. He wore his military uniform for the occasion.

While the elaborate parade was forming in a rear courtyard, I made close-ups of some of the Camel Corps members, the painted, and richly caparisoned elephants, the drummers and the floats (pages 438 and 443), from the rear of an open touring car.

The Maharaja drove "backstage" in his own costly custom-built car to see that everything was proceeding according to schedule. I inquired whether he could suggest a vantage point from which I could photograph the parade.

"Follow me," he said, and drove rapidly through a special gate reserved only for the use of His Highness. My driver followed in his wake, shattering all protocol, but orders were orders. The Maharaja found a spot for me in the market place close to his reviewing stand.

Like many festivals in India, this one began about 6 p.m. when the heat of the day had somewhat abated.

The main street of Jaipur was thronged with onlookers; housetops were covered with additional hundreds of spectators. Youngsters shouted, danced, and waved paper streamers and images of the goddess. Vendors sold *barfi*, an Indian sweet.

From atop the palace wall came a trumpet flourish (page 441). The panoplied elephants led the way, followed by the Camel Corps. Highlight in the colorful procession was the statue of the goddess, borne on a float by a score of men and preceded by a drummer on horseback. Red robes predominated in the long procession.

Dancing Girls of Amber

Backdrop for the procession was the deserted capital of Amber, five miles away, with its spectacular ruins standing boldly in the light of the setting sun.

This ancient city was known to Ptolemy. In 1037 the Rajputs captured it and made it their citadel for seven centuries, until it was supplanted by Jaipur.

When I visited the ancient ruins things were somewhat in a state of confusion, with workers busy among them, for today the old capital is being restored by the Jaipur Archeological Department.

After the procession, as night was falling, I was among those invited to the palace gardens. A huge carpet had been unrolled on the lawn and servants brought out chairs.

Returning from a Tiger Hunt, the Maharajas of Bundi, Patiala, Field Marshal Sir Grant, Mitchelleck, and Parts Pose with Their Elephants

Only men were present because of strict observance of purdah at City Palace.

The dancing girls, spectacularly clad in saris of brilliant hues, emerged to entertain us. An Indian orchestra, with ancient sitars, tumbas, and other native instruments, furnished weird music.

Each girl wore a *tika*, a spot of powder, on her forehead. In bygone days the tika stood for caste or subcaste. Today it is a decorative formality. The tika usually is made from a mixture of powders and spices, and the customary color is red. However, its color often is changed to match the wearer's sari—to black, or orange, or perhaps to a small piece of gold or silver tinsel.

Palms of the dancers' hands and soles of their feet were dyed red. For mascara they used a black paste called *kajal*, with an herb-like scent. Their perfume was attar of roses.

The morning after the festival the Maharaja arranged an elephant fight and a tiger fight for his guests.

The former was held in the elephant corral within the palace grounds. From our seat in the tower we could see an angry elephant chained at the far end of the corral. Just below us was another. But when they were released they refused to fight, despite prodding and the setting off of firecrackers.

Finally the mahouts, leading an effigy of a man, advanced towards one elephant. The beast charged and they fled, leaving the dummy behind. The elephant seized it, tossed it high into the air with his trunk, then trampled it when it fell, giving a rough idea of what would happen to a man who got in its way. This infuriated the beast sufficiently to attack the other elephant, and they butted each other for a few moments and entwined their trunks. However, their ardor soon cooled (page 415).

More spectacular was the tiger fight, held in the Jaipur menagerie on a man-made island surrounded by a moat.

We lined up in safety along the outer edge of the moat as a man-eater, captured in the jungle the night before, was released in the arena. Then another tiger, which had been in captivity for a few weeks, also was released. When he spotted the newcomer he promptly jumped into the moat and swam around vigorously (page 420).

Finally, tired of this, he emerged and was immediately attacked by the man-eater. A furious and bloody fight ensued, but it was over in a few moments as the newcomer found the neck of his opponent and killed him.

Then a small Indian sloth bear was released in the arena. The man-eater had rested briefly and rushed at once to the attack.

But to my amazement, the little bear rose on his hind legs, growled ferociously, and slapped out with his small paws. The tiger pulled up in surprise.

Four times the tiger returned to the attack; four times the little bear engaged in his desperate bluff, and he won. The tiger, after its last attempt, turned tail, climbed high into a plane tree, and refused to descend. The little bear was unharmed.

Before dinner we were guests at an international polo match (pages 444 and 445).

One of the polo guests was the Jam Sahib, Maharaja of Navanagar, one of the world's foremost gem experts. In his honor the State jewels of Jaipur later were to be displayed for his inspection at a luncheon.

To my delight, I was invited to attend. Arriving at the palace with a companion a few moments before the appointed time, we were escorted to an ornate building, open on all four sides, formerly a council chamber. We entered a large room with a raised platform at one end.

On the platform stood a big table, at least 40 feet long, with rich coverings. I immediately assumed that this was the luncheon table and that the function to which we had been invited was a large and formal affair. A turbaned servant armed with a sword stood at the head of the table.

The Author Sees a King's Ransom

As other guests, including the Jam Sahib, arrived, we crossed the room and ascended several steps to the platform. As the top of the table came within eye level I gasped with astonishment. Definitely no luncheon was to be served here. For arranged on the table in dazzling array lay the rarest jewels of the State of Jaipur—literally a King's ransom of some 150 pieces.

The rare sight beggars adequate description. There were several superb *katars*, or Rajput daggers, with finest steel blades and handles inlaid with gold and precious stones, several curved Rajput swords, jewel-encrusted from top to bottom, one a present from the Mogul Emperor Akbar; an 18th-century cane, concealing a sword, which was decorated in famous Jaipur enamel and goldwork with miniature scenes of tiger and leopard hunts.

Half a dozen pearl necklaces, each with from six to eight ropes of matched pearls, were on display, together with flashing diamond necklaces in which the stones were the size of a robin's eggs. Near them lay several diamond-studded clasps for turbans, embellished with long egret feathers.

Baggage-laden Indian Travelers Jam into a Coach to Swelter in 110° Heat

[illegible]

The Jam Sahib [illegible] up our [illegible] and [illegible] the [illegible].

[illegible] he would [illegible] and then twenty-five [illegible] that it [illegible].

The Jam Sahib pointed out to me the old [illegible].

[illegible], encrusted with diamonds, [illegible].

[illegible]

During the [illegible] asked me if I was [illegible] of the Maharaja of Jodhpur was to marry a princess of Jamnagar. He told me that I [illegible] such an event while I was in [illegible] would [illegible] Jodhpur [illegible].

Of course I [illegible] arrange[illegible] the [illegible]. [illegible] a State [illegible] to take us [illegible] as far as Jodhpur.

Princess "Mickey" Accompanies Us

The next morning I arrived early at the [illegible] His Highness. [illegible] beautifully [illegible] coach [illegible] of red and [illegible] and [illegible] chairs.

The Maharani [illegible] the princess [illegible] "Mickey" [illegible] about 15 years old. The princess [illegible] the [illegible] trip.

[illegible]

Barefoot Chuddar-draped Water Bearers Trudge Homeward in a Burning Sun

Water [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] pieces of cloth.

His Highness [illegible] [illegible] [illegible] a [illegible] with [illegible] [illegible] but he took the controls himself and had me sit [illegible] in the copilot's seat. As we sailed over the ancient Rajputana [illegible] in the [illegible] [illegible] plane, I [illegible] of [illegible] on a magic carpet over romantic lands.

Soon we skirted Sambhar Lake, and the Maharaja [illegible] out to me the great salt-[illegible]. As we went on, the land grew [illegible] [illegible] [illegible] [illegible] crossing the crest of the [illegible] Aravalli Range. On the other side we [illegible] [illegible] the small, [illegible] British Province of Ajmer-Merwara and the most sacred lake in India, Pushkar, where the Hindu god Brahma is believed to have been reincarnated.

Ajmer itself was an isolated British [illegible] [illegible] for [illegible], and still is an [illegible] [illegible] with its [illegible] [illegible] of New Delhi. In [illegible] [illegible] Moslem [illegible] [illegible] [illegible] feet above [illegible] and is the seat of [illegible] [illegible] where thousands of [illegible] and [illegible] are [illegible]. These are the only shops in India [illegible] [illegible] [illegible] [illegible] shops are now being built elsewhere.

A famous old mosque, known as the "Hut of Two-and-a-Half Days," also stands in Ajmer. Tradition tells that it was built in that length of time by supernatural powers.

Fort Looms Up Like Battleship

Soon before I had [illegible] [illegible] [illegible] Ajmer, our plane [illegible] [illegible] [illegible] in and [illegible] westward over the [illegible] [illegible] Desert. Soon out of the desert [illegible] [illegible] [illegible] ancient [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] it was coming toward us!

Teacher Shows Her Intent Pupils How to Count on an Abacus

[illegible]

The fort resembled a [illegible] on another [illegible] the [illegible] and remote [illegible] architecture.

We landed at one [illegible] most modern airports in India, one [illegible] was a busy way station during the war for [illegible] planes from Karachi to Delhi [illegible]

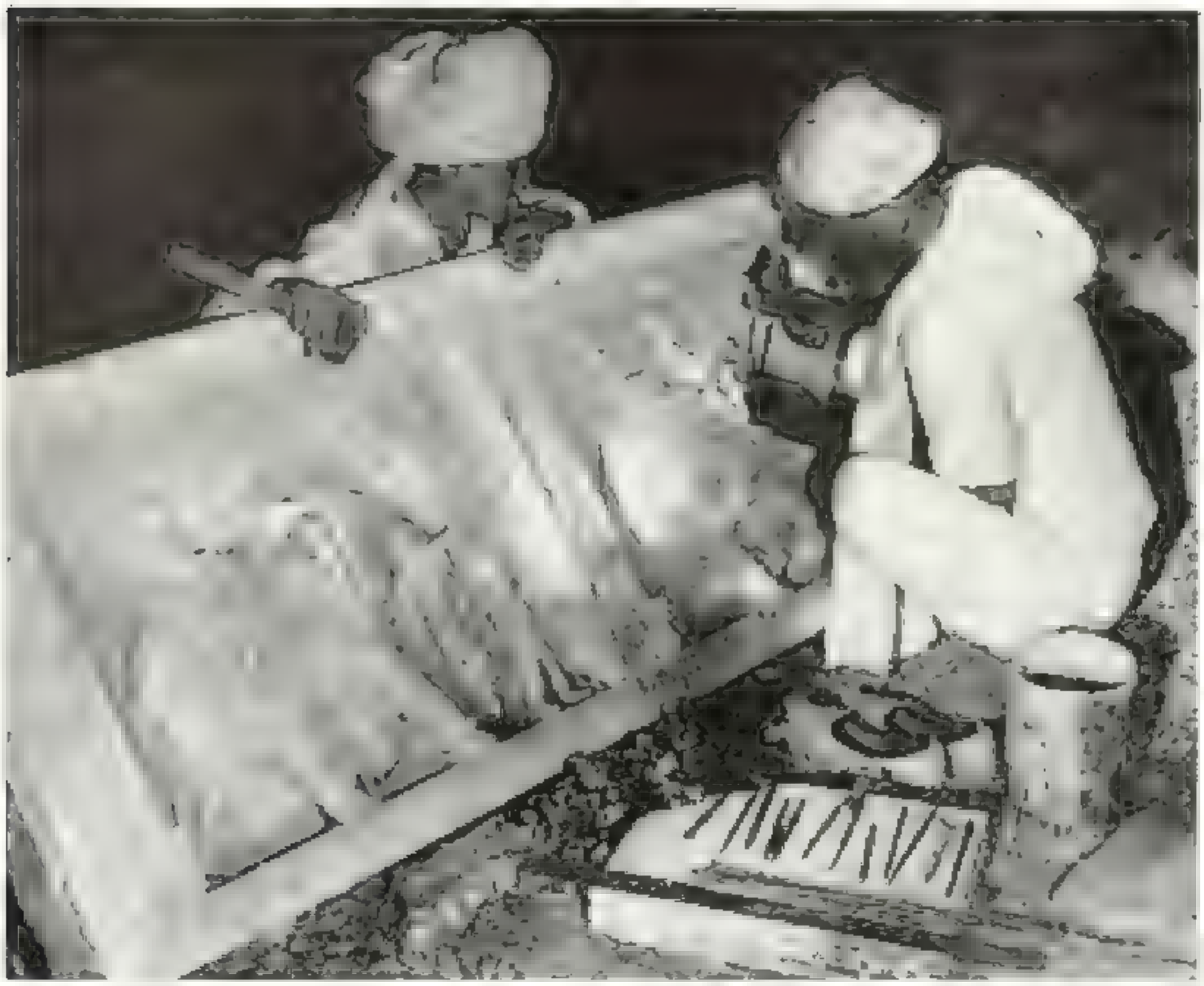
Waiting to meet us was His Highness Maharajah Sahib [illegible] He was [illegible] a charming [illegible] of [illegible] He [illegible] forward. This greet[illegible] warmth of our handclasp. However, since I was a Westernet, he shook hands with me.

The Maharaja of Jodhpur was the first of the Indian princes to become a skilled airplane pilot. [illegible] and big-game hunter. I have since learned of his untimely death.

In a big maroon [illegible] car I was taken to the State Hotel [illegible] invitation to attend the [illegible] My friend, the Maharaja of Jaipur [illegible] made my [illegible]

[illegible] Maharaja Kumar Sri Hari Singh Ji Sahib. [illegible] to the [illegible] fort. A few [illegible] hotel [illegible] I had no [illegible] dressed [illegible] do. But I also [illegible] to wear a hat. The [illegible] hustled about and [illegible] hat which he lent me for the occasion.

[illegible] the palace [illegible] Walking up the [illegible] I felt a bit [illegible] in the hat and short jacket, but the shadows were [illegible] and I was not conspicuous.



They Carve Stone Elephants for the Tomb of Bundi's Late Maharao

[illegible] Rajputana.

At the palace a long procession gathered to escort the bridegroom [illegible] Rajput royalty [illegible] in a gay and festive parade [illegible] long [illegible]

[illegible] the [illegible] with [illegible]

At this point His Highness [illegible] with a [illegible] He was [illegible] the Maharaja of Jaipur [illegible] with the [illegible] Rajputs and [illegible]

[illegible]

After dark the party [illegible] to the temple of [illegible] in the heart of the city, where [illegible] to take place. The streets were [illegible] Everywhere were [illegible] decorations and lighting effects. We were [illegible] of the temple.

Bridegroom Rides White Horse

Soon the [illegible] procession came into sight. The [illegible] was followed by [illegible] camels, [illegible] players, the Jodhpur [illegible] of [illegible]

garb, gaily caparisoned elephants, and an Indian bagpipe band.

At the end came the bridegroom, astride a spirited white horse and garbed in finest brocades covered with golden tinsel. He proceeded into the temple and the public festivities came to an end.

The next day the wedding party went on to Pokaran, about halfway to Jaisalmer, by special train (page 423). Here the narrow-gauge track came to an end; so the last stage of the journey, about 80 miles, was made across the desert by camel and horseback.

The rulers of Jodhpur and Jaisalmer, had they wished, could have transported the entire party of about 75 in automobiles or by air. But wedding ceremonies must be carried out in accordance with tradition.

State weddings are old in Jodhpur history. The House of Jodhpur is connected by marriage with the Indian States of Udaipur, Jaipur, Jaisalmer, Rewa, Bundi, Sirohi, Narsinghgarh, and Navanagar.

I drove across the desert, accompanied by a State driver. The first 100 miles to Pokaran were covered in three and one-half hours.

The rest of the trip was rough and slow, over sandy, barren desert. At infrequent intervals we came upon small villages with conical straw huts, or others with houses made of stones loosely piled upon one another. These desert people were unkempt in appearance, and their animals—camels, cattle, goats, and dogs—seemed scrawny.

Some of the communities apparently had seen better days, for they were enclosed by stone walls. One was bastioned.

As we continued, the road grew worse. The ambulance plowed through deep sand pits, and I was thankful for the powerful front wheel drive which enabled us to get through.

Then, about 4 o'clock in the afternoon, we sighted Jaisalmer Fort (page 420).

On the plain outside the ancient desert citadel stood a huge tent city erected for the wedding ceremonies. It made a gay appearance. Flags flew from each tent and bunting festooned them. In the city the hospital and some of the office buildings also were decorated with flags, lights, and streamers.

The camp was a center of much activity. Tremendous quantities of rice and curry were being cooked in big caldrons in the kitchen tents. Some of the caldrons were 6 feet in diameter. I hurried to the assembly hall, where all the maharajas had gathered.

At the end of the hall sat the bridegroom, flanked by his father and by other relatives and dignitaries. All were seated on chairs of solid silver. Bearers passed refreshments.

Soon word was given to form the procession. The bridegroom left the hall and mounted a white, richly panoplied horse (page 424). Behind him the maharajas, dressed in their rich Oriental costumes, took their places to follow on foot (page 425).

A score of beautiful dancing girls (page 423) gathered around the groom. The maharajas held silver and gold pieces, which they pointed toward the bridegroom, signifying a blessing, and then tossed to the dancing girls.

The band struck up the Jodhpur and Jaisalmer national anthems, and the parade started toward the fort. Camels, horses, elephants, gaily decorated carts, and a rejoicing mob of people followed.

The rays of the setting sun silhouetted all the people who were perched on balconies, rooftops, and other vantage points to see the spectacle (page 435).

A spectacular display of fireworks greeted the arrival of the bridegroom. Rockets, pinwheels, sputtering cobras, images of men and women, and revolving trees were flashingly outlined in the pyrotechnic display. People shouted, bands played.

At one end of the courtyard were the zenana quarters. There at the entrance, and dressed in a long golden robe, stood the Maharaja of Jaisalmer. The bridegroom, amid cheers, was led to the entrance, dismounted, and was greeted by his future father-in-law.

The parade had reached its destination and, so far as the public was concerned, the ceremonies were at an end. Only relatives, women, the bridegroom, and the Maharaja of Jaisalmer were admitted to the zenana quarters (page 426).

Along with the other guests, I passed into a large room where visiting maharajas were being entertained.

As I entered, the Maharaja of Dhrangadhra, with a regal gesture, ordered a bearer to supply me with refreshments. This was most welcome, since I had had nothing to eat or drink since K rations at noon.

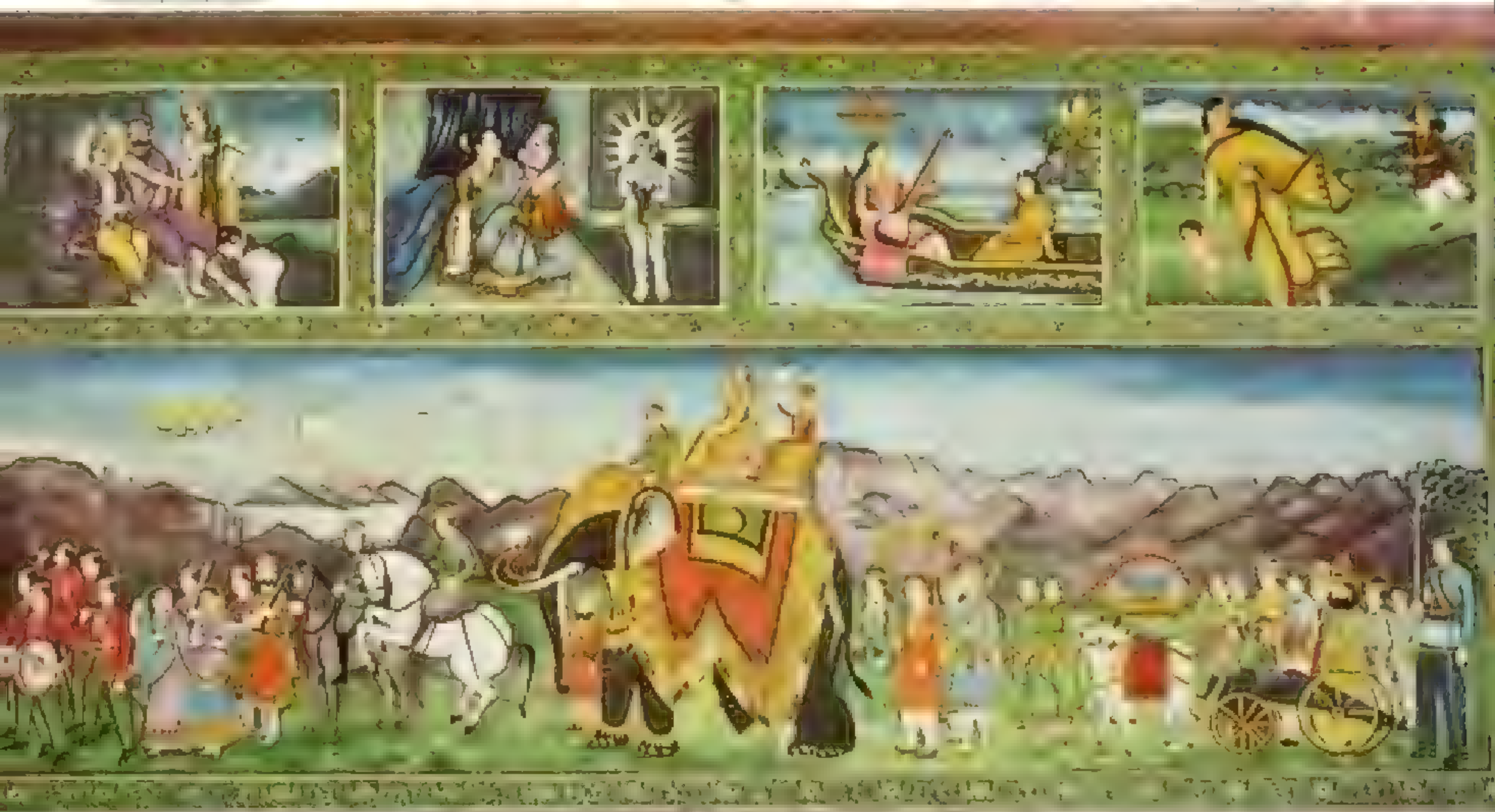
After a pleasant chat, I retired to my quarters. Tired as I was, I could not sleep soundly. Through my head passed a kaleidoscopic vision of princes and princesses, elephants, dancing girls, parties, camels, deserts, poverty-stricken villages, diamonds and emeralds, caldrons of food, fireworks, a sea of turbans, jeweled swords, golden robes, airplanes, oxcarts. Rajputana's feudal splendor left my head in a whirl.

For many other articles and photographs of India see the NATIONAL GEOGRAPHIC MAGAZINE Cumulative Index, 1899–1947.

Standing Sisters Would the Pageant of Inner Pass By Their Sacrifices

RAF Instructors Train Indian Pilots at This Training School. The Maharajas Are Also Interested

A Tuneful Caravan and Facets of Hindu Mythology Delight the Eyes of Travelers at the Gate to Jodhpur Fort



Royal Elephants Wear Painstakingly Painted Dresses during Festival of the Goddess Durga in Jaipur

Jodhpur Fort, Crowning a 600-Foot Hill, Has Yielded Once to Starvation, Never to Assault, in Its Five Centuries

A White-marble Cenotaph Stands as Jodhpur's Memorial to Its Maharajas

[illegible]

Judiciary Proudly Decorates Its Gates, Though Its Old City Wall Is Falling into Ruins

In Mendoned Mayaba Stands the Pagodalike Hova Mahak, a Monument to Antiquity

A Dressing Flourish Calls Jongleur Roscoin Gato to the Dance Festival

The Maharaja's Second Consort and Melbourne [illegible] Blue Sheets [illegible] Jaipur Lancers Members of an Australian Polo Team

One of India's Loveliest Queens

[illegible]

Jaipur's All Raptor Team Rescues Australian on the Tabo Trek

[illegible]

Conservatory of Flowers, Golden Gate Park, San Francisco

Cattle Must Laboriously Increasingly Pump, Raise Well Water to Irrigate The Parched Fields of Ajmer-Merwara Province

Galta Temple Is a Shrine to the Sun-God, a Deity of the Rajputs, the "Fire-born Race"

[illegible]

A Walking Museum of Ancient Weapons Is This Guardian of the Palace in Hindu

Mr. [illegible]'s Squeeze Box di into Its Valley. Its Old Palace Hangs from a Cliff Fine [illegible] Volcanoes of Mexico [illegible]

Tigers and Elephants Begging in the Community House of the City Sweepers, Who Dwell as a Caste Apart

The Maharaja's Howdah-topped State Elephants, Taking Their Morning Exercise Within Entering Bundi's Main Gate

Progress Provides Fund Boards, College and Science Grants, Are Stressed at the Dress

A Secluded Sewing Class Moves Outdoors for Its Portrait. "Why, I've Never Seen Two," Said the Tower Maharajah on Viewing the Picture

▲ A Lady Mam Quors Ill's Jungle Hermitage in Sessat Outside a Bamal Temple

[illegible]

▼ Dyed Cloths, Dripping Colors, Hang in the Bazaar Line Mamal's Wedding

[illegible]

Aroostook County, Maine, Source of Potatoes

By Howell Walker

With Illustrations from Photographs by the Author

THROUGH a hundred miles of unchanging wilderness I drove toward Maine's northernmost county. An occasional startled deer or a white-throated sparrow's lonely call intensified the forest solitude.

Abruptly I broke out into Aroostook's open fields. Tractors and planters rumbling over furrows killed the stillness I left behind. To me the fresh-turned earth smelled as good as land to a sailor long at sea. Here spread a new and different kingdom, governed by potatoes, worked by sturdy folk even now settling a frontier.

In the Heart of Spud Land

Late spring had just melted snow that covers Aroostook half the year; so farmers sped the planting of their soil. I raced the June sun into the heart of the spud country.

Woodland still grips nearly two-thirds of the county, larger than Connecticut and Rhode Island combined. Yet its tilled strip grows 90 percent of Maine's potatoes. And this one county's yield is more than the entire potato crop of any other State (map, page 463; 464).

In the one-crop realm some 94,000 people live, work, talk, eat, dream, gamble spuds. Yearly yields and changing prices can mean the difference between Cadillacs and worn-out shoes.

Warm days, cool nights, and even rainfall favor the region between June and September. Blessed with these ideal growing conditions, it has never experienced complete crop failure. Remoteness from principal consumers, however, makes transportation a problem.

Aroostook's pay dirt is silt-loam soil of limestone origin. One hundred and twenty miles long and a fourth as wide, the potato empire runs north and south close to New Brunswick's border on the east. The clearing carved from heavy forest reveals ground virtually perfect for its purpose (page 472).

On acreage about one-fourth the area of Rhode Island, Aroostook in 1947 grew a bushel for every two and a half persons in the United States; it produced nearly one-seventh of the Nation's 354,407,000 bushels.

I stopped at a farm near Presque Isle to watch a tractor-drawn planter. In a single operation the machine dribbled sliced tubers and fertilizer along rows which its disk plows covered with soil (page 468).

"The seed," said farmer Kilpatrick, running his hand over cut up spuds, "is practically disease-free. It was tested in Florida last winter and certified by Government inspectors. This year I'll use about 600 barrels on my 60 acres."

And he hoped to harvest 9,000 barrels or better.

For seed, potatoes were quartered, halved, or left whole, depending on their original size (page 468). Some farms relied on mechanical slicers, but I found Claude Tardif and his wife on the manual job. They sat inside a barn at the end of an inclined trough full of potatoes. With automatic skill each pushed spud after spud against a vertical blade fixed in a block of wood.

The Tardifs didn't raise potatoes; they just cut them up for other farmers. Moving from place to place, they operated as a team on piecework basis. When I saw them, they had knifed their way through 7,700 pecks for a personal slice of $365.

Farm to Live, but Live to Fish

A brief lull comes to the spud country after planting. Aroostook goes fishing. Brook trout tempt farmers to swirling waters still frigid from winter's ice and snow. In numerous ponds and lakes they troll for fresh-water salmon or fighting togue (Lake trout).

About this time I drove to Port Fairfield to interview a big-scale potato grower. I found his office locked.

"If it's the boss you'd like to see," said a workman, "my bet is that he's gone out fishing."

The telephone woke me early next morning. Sleepily I accepted a potato salesman's invitation to try for salmon the following day. As I dressed, I began to realize that most Aroostookians raise spuds to live, but really live to fish.

The waitress who served my breakfast stared with a faraway look through the window into a raw drizzle.

"Gee, I'd like to go fishing," she sighed against the pane. "Weather's just right for it."

While having a haircut, I learned that Ed had wonderful luck at the Lake; Pearley pulled a two-pounder out of the River; Sam planned a trip to the Allagash.

I had to go fishing in self-defense.

Steady, Now! An Aroostook Team, Muscles Straining, Competes in a Horse Pulling Contest

[illegible] by the [illegible] and [illegible] by real farmers, [illegible] events along with sulky racing, cattle judging, and a barrel [illegible] [illegible] Spud Lake [illegible]

Larry, the potato salesman, stowed his upholstery to the top of his car. On the front seat we piled extra clothing and fishing tackle. Ahead lay a whole Sunday and a [illegible] salmon in it. [illegible] could a [illegible] Aroostook, said—[illegible] perhaps [illegible]

[illegible] better than the [illegible] that day. [illegible] on the edge of Square Lake [illegible] Lynch. I commented on the pleasant spot.

"Sure, this is God's own country. [illegible] said, "but He doesn't stay here in winter."

Gordon Fraser, however, did.

[illegible] summer, Fraser's camps accommodate about 20 sporting guests. From Boston or New York, Cleveland or the Southern and West Indies they come [illegible] each. After the autumn hunting season [illegible] settles down to cut firewood and [illegible]

[illegible] remote lakes and ponds in the deep woods. Flying boats transport scores of Army sportsmen and local farmers. Small craft for the purpose are based all over the country. When I was there, the village of [illegible] was [illegible] for [illegible] The [illegible] a [illegible] of [illegible]

Since I first covered Aroostook, when the [illegible] pushed up from Massachusetts early in the 19th century, a handful of [illegible] reported the vast timber resources of the northeast.

However, even after Maine became a State in 1820, the area remained relatively untouched by white men for another decade. Micmac Indians moved along the river that ultimately gave the county a name: to them Aroostook meant "[illegible] of water."

First American settlers [illegible] lumbermen grew interested in the territory [illegible]

[illegible] Maine [illegible] Great Spruce [illegible]

Down the Swift, Brawling Allagash Go an Angler and His Guide

[illegible] an outboard motor, the guide poles the canoe. Each year the Allagash [illegible] hundreds of Nature lovers and sportsmen to northwestern Aroostook County. It begins at the northern end of Musquash Lake and ends at the mouth of the Allagash and St. John Rivers, near St. [illegible] 150 miles of [illegible]

Acadians began to filter into Aroostook from northern and southern Maine. Hopeless Acadians had [illegible] looking for land to call their own.

Wise Women in Blood, Steel, or Tears

[illegible] of [illegible] leg [illegible] Maine's northern boundary. In fact, nobody seemed to know just what constituted the international boundary. Lumbermen from New Brunswick and Quebec [illegible] Aroostook, [illegible] the same [illegible] the Bloodless Aroostook War of [illegible].

[illegible] soldiers [illegible] across the St. John River [illegible] Aroostook [illegible] the [illegible]

[illegible] appeal [illegible] work to their [illegible]

As [illegible] Aroostook County, [illegible]

In this remote northeast corner of the United States, the [illegible] of South America—found land the land it liked. Potatoes thrive. The [illegible] more than the people [illegible] for [illegible] of adequate [illegible] exports to the [illegible].

By [illegible] farmers were turning the [illegible] of a Canadian railroad [illegible] to handle shipments for Portland and Boston. Still the roundabout [illegible] to American markets didn't satisfy.

Three Peoples Colonize Aroostook

[illegible] Aroostook [illegible] the region. [illegible] Aroostook [illegible] their [illegible] way [illegible]

From then on, Aroostook's name was spud.

Aroostook's potato fields begin where the wilderness leaves off, but more than woods and "taters" make up the county's character. Different as French, American, and Swedish can be, three distinct colonies settle over separate regions. The potato, however, is common to all.

Despite its name, Presque Isle marks the center of the American section. Here people use Yankee slang glibly and eat apple pie with ice cream.

Outside the city I spent much time at the farm of Lewis Christie. With devotion he tilled the potato fields inherited from his father.

When a boy, Lew hoped to be anything but a slave to spuds; so he worked his way through the University of Maine. Graduating at the top of his class, Christie wore a white collar in several office jobs. Eventually, the old blue shirt and potato dirt won him back to the land.

Near Caribou, Ken Towers managed his fourth-generation family farm. He seemed more familiar with its 521 acres than with the 26-room house. After college and a few years of Wall Street brokerage, potatoes brought Ken home to the business he preferred.

Sweden and France in Maine

Towns called New Sweden, Jemtland, and Stockholm drew me into the Swedish colony. I sat in the home of Agnes Anderson, talking with her through an interpreter. In 1870 she reached New Sweden with the 51 original Swedish colonists of Maine, and outlived them all.

At Stockholm the Tall family and I reminisced on their native country. In 1902 Gustaf's father had worked his passage from Sweden to Maine. He held odd jobs around Portland for a year, then moved north as a lumberjack. Later he saw the light of Aroostook; at 82 he was still an active potato farmer.

For dessert I saved my visit to the French area. Church spires dominating the villages of Lille, St. David, and Notre Dame gave the banks of the St. John a French look. Even in such un-Latin-sounding towns as Fort Kent, Madawaska, and Van Buren one commonly spoke French.

Among my friends in this northernmost part of the county were Boucard, Michaud, Garreau, and Nadeau; Pelletier, Jalbert, and Paradis. I met Pinkhams, Smiths, and Lages, too; and the prettiest, Frenchest girl of all went by the name of "Scotty" Scott.

Before Aroostook officially belonged to Maine or the United States, Acadians settled in the St. John Valley. As their axes ripped apart forest, these French, like most people in the county, took up potato farming.

How were they doing today? Well, one farmer quietly told me he'd just received a refund of some $30,000 on his income tax.

Aroostook farms vary widely in size; otherwise they all look alike. Two-story frame house, barn, and half-sunk potato house float close together on a sea of regularly rippled fields.

In Aroostook's American domain Don Kilpatrick plants 60 acres; a few miles from him Frank Hussey sows several hundred. Most farms in the Swedish realm have an acreage of 30. French-section properties range from tennis-court size to vast hillsides with alluvial flats thrown in.

By the latest limousines or 15-year-old trucks, thousands of Aroostookians converged on Caribou for the annual potato blossom festival, toward the end of July. A number of towns and villages sent their fairest candidate to compete for potato blossom queen of Aroostook County (page 467).

Veterans Settle in Maine Woods

To see the quieter side of Aroostook, Sam Jalbert, guide, and his canoe took me through the heart of the northwest forest. Aside from the maintenance crew at a logging dam, we met few persons during the four-day trip.

Maynard and Earl, two of Sam's sons, lived with their small families in a one-room cabin on remote Round Pond (page 477). The men felled, barked, and hauled cedar trees for telephone poles, while the women kept house and cared for the children.

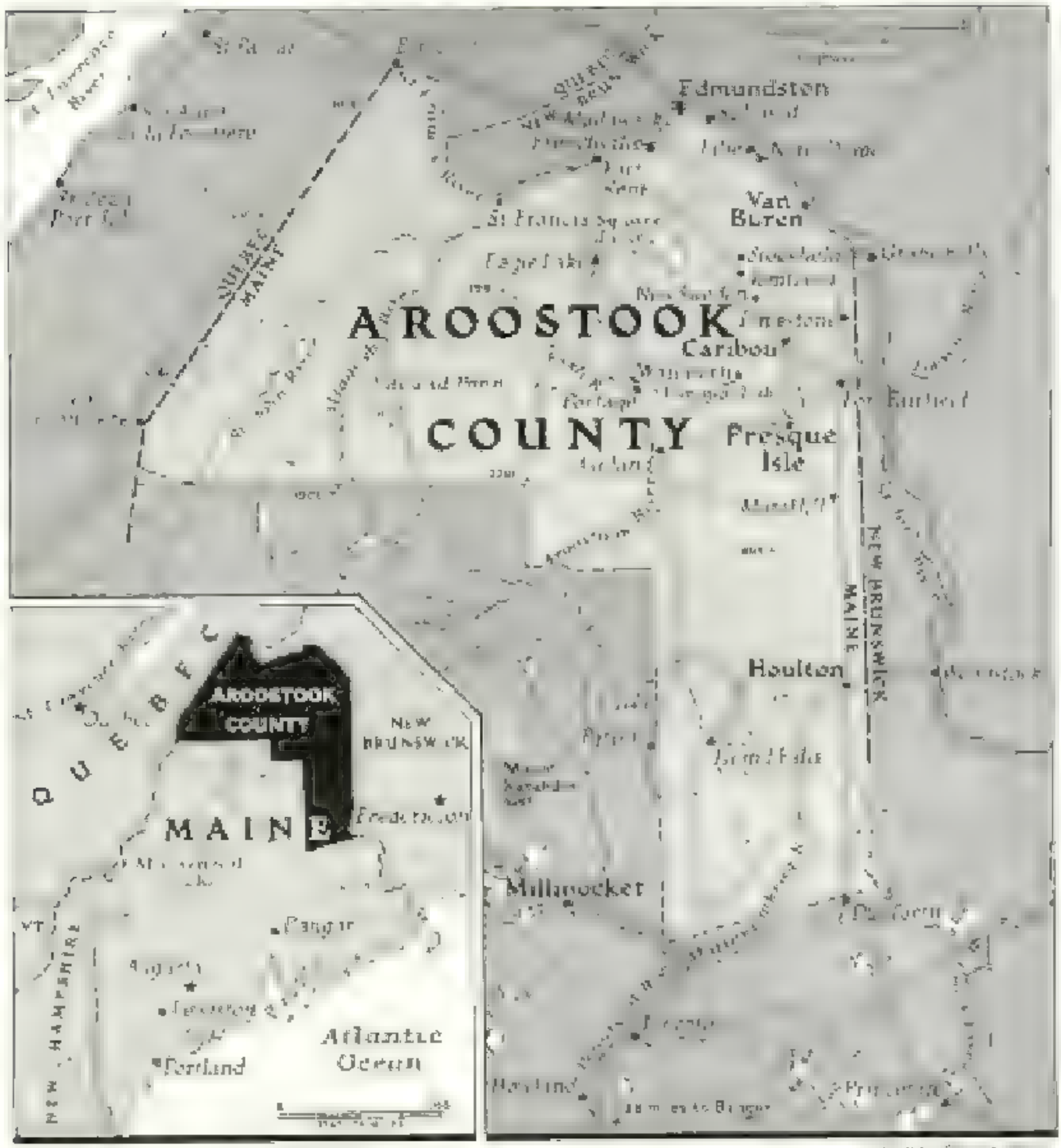
They invited us to share supper at their table, but Sam declined. He knew too well the difficulties of getting supplies to the lonely spot. He wouldn't even accept a cup of coffee.

The brothers had served with the military forces. After the war, they couldn't find a home in civilization; so they took to the woods each with his wife and two little children for life in the forest one of the women began with only a picnic background; she was city-born, city-bred.

"This is no picnic," said Earl, who had been wounded at Iwo Jima, "but you gotta make a living somehow."

As a Maine guide, 58-year-old Sam Jalbert knew more tricks of the trade than you could shake a fly rod at. He made pork and beans from a can taste as good as trout we pulled from the river. Our beds of fragrant balsam boughs beat the most luxurious mattresses.

Through rocks and foam of the lonely



The Spud Is King in Eastern Aroostook; Forests Cover Nearly Two Thirds of the County

Presque Isle, Caribou, and Houlton are here centers of a Maine potato empire about one fourth the size of Rhode Island. The tilled strip has never known a complete crop failure. To the north and west lie vast woodlands area threaded with rivers and dotted with lakes, where hunters and anglers find sport.

Allagash, Sam handled a canoe with the calm skill that marked everything he did. To prove it was simply a matter of practice, Sam maneuvered the boat over the roughest stretch while standing on his head! (Page 405.)

A "Potato Pickers' Dinner"

But even well-paid Maine guides succumb to the spell of spuds. A couple of months later I ran into Sam at Fort Kent. He invited me to a "real potato pickers' dinner" on a farm employing him for the harvest.

In August the Northern Maine Fair and Agricultural Field Day kept me close to Presque Isle. For a week everyone seemed to forsake spuds for March and July. I joined crowds to watch sulky races, horse pulling contests (page 400), and baby-beef shows and to wander through the blatant midway called "World of Mirth."

Annual Field Day at the Agricultural Experiment Station here brought talk of potatoes in down-to-earth language of the soil. Farmers from all over the county gathered to hear expert

Aroostook's Immigration Pay Dirt: Tilled in Long Rows, Produces Nearly a Seventh of the Nation's Potatoes

[illegible] Aroostook River [illegible] Harvesting [illegible] September. The Maine [illegible] a [illegible] the New Brunswick [illegible]

Shelteres by Mesh's Teers, "Guinea Pig," Spread Grow under the Eyes of Waterfal Scientists

[illegible]

Guide Sam Gilbert Alcorst (L), Knows More Tricks than You Could Shake a Fly Rod at

[illegible]

advice and to see the latest tractors, planters, plows, and diggers. Like a dragonfly itself, a helicopter dusted plants against insects (page 470). It might replace less maneuverable airplanes as it hovered above local fields for the first time.

Conscientious Aroostook growers comb their foundation stock and certified seed crops for signs of disease. Spraying regularly with Bordeaux mixture-DDT solutions, they beat down bugs, control late blight, and increase yields.

Often I found men, women, and children moving abreast along the potato rows. Each had a bag slung over a shoulder and wielded a long-pronged hand digger. When they discovered an unhealthy plant, they pulled it out, tubers and all, it went into the sack to prevent spread of infection. "Roguing," they called it.

People turned out to rogue as they would to night a forest fire or to fish. Some even used the term, roguing, to describe an evening of indoor fun. And once when I couldn't find the shoe-shine boy his boss explained, "Out to rogue . . . but really."

Orchids Grow Wild in Northern Maine

Because Aroostook farmers frequently use between one and two tons per acre, I visited a Caribou fertilizer plant; in a busy year it mixed 40,000 tons of nitrogen, superphosphate, and potash. Byron Hand, a foreman, showed me around. Despite the odor of his work, he lived in a world of flowers.

"Would you be interested in rare orchids?" he asked. "I can find some in a bog seven miles from here."

Byron led over the soggy floor of a forest thick with spruce and black with flies. I stopped frequently to scratch lumpy bites and wonder what I was learning about fertilizer. At last we reached the mossy bed where grew the small round-leaved orchids (*Orchis rotundifolia*). Like tiny narcissus flowers they rose on straight stems, their heads a delicate white flecked with lavender.

I still had more than flowers to find; so I looked into one of Aroostook's 20-odd starch factories. George Washburn, the manager, told me that his plant made a hundred and seventy 200-pound bags of this by-product each day. Examining one of the sacks, I found no mention of potato on the label—just the word "Starch."

"But Presque Isle is printed on the bag," explained the manager. "Everyone knows that means potato."

From Washburn I learned that the adhesive industry uses starch in the manufacture of glues, pastes, and dolls; that it goes into the making of corrugated shipping containers, cushioned wrappers for electric light bulbs, solid fiber cartons, and sizing for paper. One big single use is as a protective sizing for warp threads in the weaving of fine sheetings, shirt materials, lawns, etc.

On the outskirts of Caribou I went through a distillery which in a single day could turn 5,000 barrels of spuds into nearly twice as many gallons of pure alcohol (ethyl). Briefly, the process boils down to washing, cooking, malting, and yeasting, then 52 hours of fermentation prior to distillation.

Potatoes Go into Everyday Articles

This potato by-product goes into the manufacture of such items as antifreeze, cements and disinfectants, paints, varnishes, and their removers, waterproofing compounds, motor fuel, enamels, shoe blacking, and soap. Amazing how many articles in everyday use have original roots in Aroostook soil!

Without hydroelectric power Aroostook factories couldn't keep up with the spuds they receive as raw material. And without Sam Feagles the Maine Public Service Company would be just another local utility.

I first met Feagles in a garage, his hotel on rare visits to Presque Isle. (He much preferred to stay in the country under canvas or at a cabin.) In a long-sleeved undershirt he sat behind a copy of the NATIONAL GEOGRAPHIC MAGAZINE.

"Of course, I don't know how to read," Sam joked, "but I sure like to look at pictures."

Sam Feagles was graduated from Princeton University in 1900. For the next ten years he served on the faculty of his alma mater.

One summer vacation he navigated a Grenfell mission craft to Labrador. Later he went to Aroostook for a fishing and hunting holiday—and never left the county. Sam was, as he put it, "still on that original outing" and, incidentally, area field supervisor for his company.

Feagles and I bounced in a truck over 30 rugged miles toward the town of Limestone. We carried a load of dynamite for crews hooking up a power line to a giant bomber base under construction.

Conversion of potato country to a super-airfield put Aroostook on the Nation's front line of defense. We stopped at headquarters to see Robert E. Lee, resident engineer in charge of all operations. After an hour's search, we still hadn't found him.

By the time we overtook Lee in his jeep, out on the five-miles-square project, we had

Like a Spreading Stone, Pamela Bassons Light Up the Pages of Arrowsmith County

Sheed Pumps Double from the Hopper to a Planter where Fluted Disks Cover the Seed with a Few Inches of Soil

Children Wade Waist Deep in Arrowroot Cinerea Pioneer Blossoms

[illegible]

Hovering Close to the Ground, a Helicopter Makes Way with Charged Dust on Bright and Insects Attacking Pastry Plants

[illegible]

Instead of Awaiting the First Freeze, Farmers Kill Potato Vines with a Triple-Jointed Flame Thrower Ten Days Before Harvest

Tractors Roll on as Bucks Step up Aircrook's September Potato Harvest

[illegible]

We Distribute Tickets to Peanut Pickers for Each Barrel They Fill; on Payday They Exchange Cards for Cash

▲In Heated Bins Half Underground, Potatoes Stave Off Maine's Subzero Weather

[illegible]

▼Falling Mustard Weed Causes No Worries among This Happy Trio

[illegible]

acquired working knowledge of the base. He rounded out the picture; and, yes, he came from Virginia.

The $35,000,000 undertaking involves some 10,000 fairly log-free acres 700 feet above sea level.

Eighty percent of the area taken over by the Government consisted of waste, bog, or wooded land; it would have required tremendous capital of individual farmers to clear, drain, and drain it for cultivation. Where productive fields lay within the territory, engineers and equipment spared the crops until after harvest.

With 800 workers then on the job, Lee predicted the number would double within a year. We saw frames of large dormitories, mess hall, infirmary, and recreation building; watched colossal caterpillar tractors and gravel gatherers move hills and fill in valleys; shook with monstrous mechanical shovels excavating the route of a supply railway.

In 1949 Lee expects to complete the first runway of our closest "States-side" base to Europe. Other runways will come later as enormous parking aprons and hangars take shape.

Meanwhile, the once-quiet little community of Limestone goes bound. A thundering construction herd bears down on the town; its cost of living rockets up. And farmers paid by the Government to vacate their land look elsewhere in Aroostook to raise potatoes.

Via Canada to Remote Township

I had to leave the United States altogether to reach the remotest settlement in the county. Crossing the St. John River at Fort Kent, I followed a narrow dirt road through New Brunswick into the Province of Quebec. An underpass in a high railroad embankment at Estcourt linked Canada and the United States. By this international thoroughfare [illegible] Township 20 Ranges 11 and 12.

The tiny American community of a dozen houses has no other name, not even a post office of its own. Mail arrives and leaves by royal arrangement with the Estcourt depot. Everything inward or outward bound, including people, passes through Canada. Goods originating in the States enter duty-free if conveyed by a United States customs officer.

Citizens of the settlement occupied homes partly in Quebec, partly in Maine. One building, for example, stood on Canadian soil its outhouse in the United States. At another, the International Boundary separated front parlor and kitchen. I did not learn which country taxed whom or for what.

However, I made one startling discovery: an Aroostook township independent of the potato business. Small goods, woodcutting, and timber mills employed most of the men.

Speaking French to declare herself an American, a woman of the community gave me official permission to travel a lumber company's private road.

Twenty miles deep in the wilderness, Roland Roblue supervised logging operations.

Shortly after I arrived, the cook hit an iron triangle hanging outside the mess hall door. About 45 lumberjacks streamed in for supper. With them I sat down to bean soup, boiled meat, potatoes, and canned string beans, home-made bread, butter, strong tea with sugar but no milk, several kinds of pie, stacks of doughnuts, cakes, and cookies.

Scarcely anyone spoke during the meal; too hungry, I thought. Then, glancing around, I saw a sign: "Silence at the table s.v.p. Par ordre."

"Why?" I asked the cook.

"Many men to feed," he replied. "When they talk and joke, takes longer to eat and leave."

I caught on and got out.

Lumbering, Like Farming, Now Mechanized

Roland managed three lumber camps in the area. Principally occupied with pulpwood, they aimed to cut 15,000 cords for the 1948 spring drive. Tributaries took logs to the St. John River, which carried them as far as Fredericton, New Brunswick. Here formed into rafts and towed to St. John city, the wood went through mills into magazine paper.

Over a road Roblue constructed we penetrated a forest that would keep his men busy for the next ten years.

Formerly, axmen had to trudge, sometimes for days, over rough trails to lumber camps in the wilderness. They went to work in autumn and didn't see civilization until spring.

Now, with the building of all-year roads through the woods, come tractors and trucks, mail and fresh food. Lumberjacks regularly ride home for week ends. Transportation of timber to mills no longer depends exclusively upon rivers and streams.

Roland walked over to my car as I prepared to leave his camp.

"When you're on the big hill," he said, "just stop and look back. I've seen that view countless times, but it always gives me feelings. Do you know what I mean about the woods?"

I reached the hilltop and looked back at miles of endless forest; but Roland's feelings impressed me more than the view.

This Sign Tells the Story—U. S. Highway 1 Begins with Pines and Ends with Palms

[illegible]

[illegible] Aroostook's wilderness [illegible] the open spud country; the [illegible] held no attractions.

In [illegible] brothers had built a unique factory. From [illegible] pany of soldiers working to use several out-[illegible] from I saw four separate huts standing in a line and opposite them stacks of finished potato barrels.

[illegible] fire wiped out the Parades' part when [illegible] piled one large building. To avoid losing their entire plant destroyed a third [illegible] by flames, the [illegible] a quarter [illegible] smaller units. If [illegible] burned three [illegible] intend to roll out the barrels.

Two men worked in each hut, equipped with a stove for steaming wood into shape and a wagon-wheel winch to tighten a rope [illegible] vise. One [illegible] fitter, tongue-and-groove staves together, put hoops and bottom pieces in place. His partner did the nailing. An average team completed 65 to 75 barrels a [illegible] units turned out a total of 55,000.

The [illegible] or pick spuds as they chose. In no way did [illegible] become business; in fact, it arranged its working schedule to meet farmers' seasonal demands for barrels or labor.

Potato Picking Takes Priority

At harvest time some 20,000 [illegible] filtered into Aroostook from all [illegible] Approximately 5,000 Canadian pickers [illegible] Quebec, New Brunswick, and Nova Scotia crossed through customs [illegible] with them crossed a few hundred [illegible] Indians whose boundary rights [illegible] and clearance at the frontier.

"This Is No Picnic," Says Earl Talbert, "But It Beats Two Jobs"

The postwar housing shortage drove the veteran and his brother, Maynard [illegible] to this one room cabin on remote Round Pond. The brothers earn their living [illegible] for telephone poles. They were among the few people the author met on a [illegible] in northwestern Aroostook County's forests (page 82).

Aroostook schools closed to let children help with the digging, and employment in town industries dwindled for the same reason.

Normally 12 men and [illegible] women [illegible] potato factory prepared [illegible] 1,000 paper potato bags a day. When I went through the work [illegible] for female [illegible] harvest.

I watched a spool weighing [illegible] of raw sack material unroll in a low [illegible] fed a machine that cut, stamped, and added burlap from India. Women stitched the stuff into bags to hold 100 pounds of potatoes [illegible] finish a [illegible] day. But I didn't see [illegible] nimblest fingers they were picking in [illegible].

Harvest of potatoes for next year's seed precedes the gathering of table-stock crop to get the seed crop safely housed against rain [illegible] frost and to lessen the danger of disease [illegible]

Before admitting me to his seed ground [illegible] feet with formaldehyde [illegible] Tickets, including baskets and barrels, were doused all over. And I had to wade through a "duck pond" of disinfectant to enter the building that stored the harvest.

The Growing of Certified Seed

Aroostook County grows [illegible] of the certified seed in Maine and about 15 per cent of all in the United States. In [illegible] shipments from Maine went to [illegible] states, the District of Columbia, Europe, Africa, and South America. They amounted to nearly 1,000 railroad carloads, or more than four million 100-pound sacks.

With whole families of citizens I went [illegible] one morning to see table-stock harvest. Everything happened on a larger and less

"Let's Go Fishing!" Minutes Away, by Air, Lie Remote Unspoiled Waters

During the lull after potato planting Aroostookians angle for trout and salmon. Small airplanes [illegible] Portage Lake, are based all over the county. The village of Portage, on the lake, [illegible] [illegible]. In them visiting and local [illegible] [illegible] to wilderness lakes and [illegible] [illegible].

[illegible] [illegible] the [illegible] collection of [illegible] would [illegible] unchanged and [illegible].

[illegible] along the [illegible]. [illegible] followed [illegible] gathering potatoes. In [illegible] manual labor [illegible] to work (page [illegible]).

Bushels and Backaches per Acre

[illegible] to [illegible].

[illegible] the [illegible] of the rate of around [illegible] cents [illegible] barrel. Men [illegible] earned $[illegible] or more a day; women and children averaged about $12.

For less than an hour I tried picking potatoes—and oh, my aching back! I [illegible] who filled [illegible] barrels [illegible] per [illegible].

As an excuse from further [illegible] I followed a truckload to storage.

The potato house is the symbol of an Aroostook farm. Constructed [illegible] to keep out winter freeze, it looks [illegible] somewhat like [illegible] market.

Many [illegible] potatoes [illegible] conveniently packed into [illegible].

[illegible] more to me than to [illegible]. With grocers in New England or Maryland [illegible] discussed relative merits of various brands; without question, Down-East "taters" were hard to beat.

Wherever I found Aroostook potatoes, they renewed old acquaintances, refreshed [illegible] memories. After all, I had watched them grow up and I liked the people who raised them.

Brazil's Land of Minerals

By W. Robert Moore

With Illustrations from Photographs by the Author

CLOUDS [illegible] clusters over the crumpled landscape when I flew from Rio de Janeiro 200 miles north to the city of Beautiful Horizon—Belo Horizonte. The rainy season was nearing its end. Cooler dry months were just ahead.

Belo Horizonte lay in open sunshine. Its old business district and wide circle of white-walled, red-roofed homes gleamed in precise pattern below us.

Hills girt the city; on the south an iron range rears like a majestic wall. But the city is sufficiently level so that residents can walk not climb up and down precipitous streets as people have to do in old Ouro Prêto, early capital of the State of Minas Gerais.

Coming into the city from the airport, we sped over a new road that threaded raw red cuts in the hills. Red splashes of excavated earth and unfinished buildings attest the capital's rapid expansion.

For sheer youth and exuberant growth this State capital has few equals. And it is completely tailor-made.

Little more than 50 years ago it was only a diagram on a draftsman's table, a site on open space on the plateau. Where bold planners staked out rectangular blocks, wide diagonal avenues, parks, circles, and squares now stands a metropolis of more than 200,000 people.

Its business blocks climb skyward; one is 26 stories high. Its residential and industrial districts expand day by day. Its growth seems not to slacken.

The State of "General Mines"

Interesting, too, is the State that gave it birth.

Minas Gerais means "General Mines." A wealth of minerals is crowded into this mountain-rumpled region, roughly four fifths the size of Texas (map, page 481).

Embedded in the earth are gold, diamonds, an array of semiprecious stones (page 500), and vast quantities of pure quartz crystals.

Here also are rich resources of manganese, mica, bauxite, beryls, and fabulous deposits of iron ore—whole mountains of it—one of the biggest and richest reserves of high grade ore in the world.

To the "hard" minerals can be added the liquid assets of several spas with radioactive and mineral laden waters.

From the melodramatic days of gold and lurid discovery until World War II, when Minas contributed richly in crystals, mica, manganese, and other strategic materials, mining has helped foster the State's rise. Yet many of these mining resources have been only scantily developed. Agriculture and stock raising dominate its plateau lands.

Despite its contrasts, Brazilian roots reach deep into the State's red earth.

From the 16th to 18th centuries bold, rugged, Paulista *Bandeirantes*, or Flag-bearers, roamed this interior region. Struggling over rough mountains and probing deep-cut valleys they won new territory for Portugal.

But they wanted gold. And when they found it, in the early 1690's, here began a frenzied rush, such as was to come much later in California, Australia, and the Klondike.

There was one important difference. Many men herded slaves into the region to pan the streams and sluice the hillsides. Hundreds of officials were sent from Portugal to guard the gold taking. For the king claimed a "royal fifth," plus heavy taxes, imposts, and "voluntary gifts."

Some of the rough mining camps grew into villages and permanent towns. Nestled within the folds of the steep green hills are such old mining centers as Ouro Prêto, Mariana, São João del Rei, and Sabará. Time-mellowed museum towns they are now, rich in Portuguese colonial architecture and boasting some of the finest churches in the country.

Among the medley of peoples who came with the flash of gold, many stayed to build homes and continue more settled pursuits.

Although not so highly developed or industrialized as São Paulo or the coastal districts about Rio de Janeiro, Minas Gerais has a population of about 7,500,000 persons.

Key centers of Belo are the Praça da Liberdade, about which are located the Governor's Palace and State Buildings, and wide, tree-lined Avenida Afonso Pena. Along this avenue are select shops, towering office buildings, Post Office, and trim City Hall. It is also the concourse for all Belo Horizonte (pp. 491, 502-5).

"Taking Their Footing" on the Avenue

I had arrived in Belo late on a Saturday afternoon. That evening when I went for a walk with an acquaintance I found the avenue surging with thousands of people.

A Modernistic Yacht Club Frames the Casino at Tacoponda, near Belo Horizonte

[illegible]

Minas Gerais, Brazil's Mineral State, Is Roughly Four Fifths the Size of Texas

It sprawls beyond the coastal range and embraces a mountainous plateau covering nearly 6[illegible] square miles. The highest peaks rise from 6,000 to more than 9,000 feet in height. Named in Portuguese colonial days for its gold and diamonds, it has rich deposits of iron, manganese, and other minerals.

Up and down the length of several blocks flowed two congested streams of pedestrians. Mammas and papas marched with little Joãos, [illegible] and Conceições. Men walked [illegible] or more, or stood to gaze at the female passers-by who flashed dark wide eyes. Giggly schoolgirls moved in squadrons.

"They call it 'taking their footing,'" commented [illegible] Minas [illegible] Sundays.

[illegible] North American films. Mexican-made films, however, are gaining wide popularity. English or Spanish dialogue is supplemented by subtitles in Portuguese.

"Our matinees are our flirtation programs, so look out," laughed my companion. "The real romantic advance is when a young man meets his girl and goes to the movies."

On Sunday thousands stroll through the large central park adjacent to the Avenida Afonso Pena.

In this combined botanical garden, zoo, and wide greensward, lovers can look at the love birds while others listen to the chatter of parrots, see gaudy macaws, and watch the antics of the animals. A chain of artificial lakes also affords a boating pastime.

Sunday a Day for Sports

Sunday, too, is a big day at the Minas Tennis Club. Young folk flock to this remarkable sports center, filling its tennis courts, basketball courts, and magnificent swimming pool (page 453).

Still more pack the dance floors in the club building. Pulsating, wailing bands furnish music for samba and swing.

This extensive recreation unit was the first of several built in Minas under State direction. To raise funds for the enterprise, the State took the concession on lotteries. Boys from the parent club assist in teaching swimming and other sports when new places are opened.

Swimmers developed here in Minas have

At Itabira Men and Donkeys Tread Streets Paved with Iron

The [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] What [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

captured the national championship [illegible] [illegible] [illegible] [illegible] was opened."

Another entertainment center for Belo Horizonte is [illegible]. Around a [illegible] artificial lake a few miles north of town [illegible] have [illegible] in a big way. With [illegible] [illegible] [illegible] [illegible] [illegible] and night club, a Yacht Club which many say [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] and an open dancing pavilion [illegible] [illegible] [illegible] [illegible] [illegible] (page 485).

In Belo Horizonte a spirit of [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] by walking [illegible] [illegible] [illegible] [illegible] [illegible] at the head of Avenida Afonso Pena. There are [illegible] [illegible] [illegible] [illegible] and [illegible] and the State [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] and [illegible] [illegible] [illegible]. The [illegible] have [illegible] [illegible] [illegible] exhibits [illegible] [illegible] [illegible] [illegible] which weighs [illegible] [illegible] [illegible] (page 487).

From the top of the tower where [illegible] [illegible] [illegible] balconies and [illegible] new [illegible] skyscraper near by, I saw [illegible] [illegible] [illegible] Minas. [illegible] [illegible] of Belo Horizonte (page 483).

When the designers [illegible] the plan of [illegible] Minas [illegible] [illegible] [illegible] —they [illegible] a Circular Avenue [illegible] the town. Now the [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] Residential [illegible] [illegible] [illegible] beyond it.

The [illegible] [illegible] [illegible] [illegible] a stately [illegible] [illegible] [illegible] with [illegible] [illegible]

They have seen its purpose change. Having grown as a distribution center for the State, it is also beginning to industrialize. A new factory suburb has been plotted. High tension lines stride in from an outlying hydroelectric dam to supply power; several large plants already are in operation.

Swing up around the Circular Avenue one day, I noticed a number of gleaming white markets. These State-organized centers were designed to improve the quality of produce and to stabilize prices.

The big central market in the heart of the town, however, has more local color. Stalls, stands, and cages grouped in the block-square area sell anything from a squealing pig to sure-cure snake oil.

Within the pavilions and at open stands throngs of shoppers pick out fruits, vegetables, and other farm produce.

Small shops offer woven baskets, floppy straw hats, heavy bowls carved from soapstone, bean pots, and kitchenware.

Cages hold live chickens, turkeys, quacking ducks, and grunting pigs. You can pick your fowl or porker and, if you wish, have a handy butchery prepare it for the cooking pot.

Hawkers, snake charmers, and spellbinders add the flavor of a fair.

Off to "Old Mountain"

Early one morning I set off for Sabará, Itabira, and beyond.

It is only a short detour from the main Sabará road to the gold-mining town of Morro Velho, the "Old Mountain."

Old, too, are the gold-mining operations going on here, I learned when I talked with the English manager.

"Our company was founded in 1830 to work at São João del Rei. But we came here in 1834 and have operated this mine ever since," he explained.

"More than 100 years! And what have you done?"

"We've dug a hole and got gold!" he retorted, and laughed.

Then for hours I was shown the complicated processes needed to extract gold from the dirty gray ore.

The "hole" is more than 8,000 feet deep. At such depths rock temperatures are high. Huge refrigeration plants and blowers, with an air capacity of 110,000 cubic feet a minute, pump cold air into the shafts.

From its shafts and maze of underground tunnels workmen have hauled up 12 million tons of ore, yielding gold valued at more than $110,000,000 at the present exchange.

"Is it true that mules used in the tunnels get dizzy and cannot be used again if taken above ground?" I asked.

"They convert around when they get in the sunshine, but they don't get dizzy. We bring them up on holidays."

Additional ore comes into Morro Velho's plant from the nearby Esperança mine by aerial tramway. Though each bucket holds more than a ton of mineral, the gold it contains would fill only a small coffee spoon.

As we zigzagged over the hills and dropped down into the valley of the Rio das Velhas near Sabará, we came upon other goldworkers, free-lance gold pinners, called *garimpeiros*, washed the sand in the river bed (page 508).

Some had built dams and channels to trap the gold-bearing sediment. Others sluiced sand over tickety chutes. Their methods haven't changed a whit since gold was first struck in this river trench.

Several showed us their small finds—perhaps 30 or 40 cents' worth for a day. Small as are the individual pickings, free-lance enterprise nets as much gold as comes from organized mining.

Pioneer Gold Town Turns to Steel

Sabará itself is one of the original gold towns. It has long since gone off the "gold standard." Today it lives on steel.

Many of the crooked streets bear vivid marks of colonial days. Old houses sag wearily against each other. One venerable building, formerly the office of the superintendent of gold production, is now a museum, filled with heavy handmade furniture, old iron-bound gold chests, big scales for weighing the metal, and a press that once stamped coins.

Among the displays I saw one mining account book for 1772-73, listing taxes and operation expenses. Another, dated 1734, showed the royal fifth handed over to the Portuguese king.

Weathered churches stud the village. Some have richly carved doorways and altars credited to Aleijadinho, the malformed Michelangelo of Minas.

Properly, the story of Aleijadinho, the "Little Cripple," belongs to Ouro Prêto. For there, in 1730, he was born, Antonio Francisco Lisboa, son of a Portuguese carpenter and a Negro slave (page 490).

Ugly, misshapen, and in later years with hands so wasted with disease that his chisels and mallet had to be strapped to his arms, this twisted and distorted sculptor did outstanding work. The statues of saints he hewed are sturdy and vigorous (page 496).

Outside old Sabará, blast furnaces belch

Daughter and Father Examine a 325-Carat Diamond

[illegible]

[illegible] Since 1922 [illegible] Minas has produced iron and steel products here.

[illegible] output [illegible] tons a day. [illegible] for the [illegible] at Monlevade [illegible].

[illegible] Monlevade plant [illegible] tons of pig iron annually. Lacking coking coal, these plants [illegible] charcoal. [illegible] are employed [illegible].

Traveling down the valley of the Rio Doce later, I saw huge piles of charcoal heaped beside railway stations. [illegible] mines, [illegible] of the river I saw [illegible] other loads of charcoal.

The "Iron Quadrangle"

Iron abounds in a wide region about Belo Horizonte. The earth [illegible] so plentiful [illegible] that Brazilians refer to the district as the "Iron Quadrangle."

Cauê Peak at Itabira (Presidente Vargas), a big mountain knob [illegible] plate [illegible] product. [illegible] 1942 [illegible].

[illegible] are [illegible]. Recently a large Brazilian company [illegible] The Export-Import Bank [illegible] of the iron [illegible] in the [illegible] mines where [illegible] are necessary, Itabira's operations will [illegible]

Work thus far has been [illegible] trucks haul the [illegible] to the railway. Once [illegible] installations are completed, however, [illegible] high [illegible] on the hillside [illegible] storage bins.

A [illegible] village complete with hospital and other facilities has been [illegible] to house the mine workers.

"[illegible] to chop off the top of [illegible] peak down to the level where we're installing the crusher will take at least [illegible]

[illegible]

This Hen Contentedly Puts All Her Eggs in One Basket

[illegible]

[illegible] it at the plant [illegible] of [illegible] gold from here [illegible] an even bigger [illegible].

[illegible] to the port of Vitória, [illegible] miles away. [illegible] Indians. The [illegible] had to be [illegible] and have [illegible] and bridges strengthened—a [illegible] in itself.

From [illegible] I traveled down the Rio Doce Valley [illegible] the town of Governador Valadares, a trading center of some [illegible] persons.

During the war I had seen it when [illegible] from the [illegible]. [illegible] American [illegible] experts helped the Brazilians [illegible] the hills [illegible] were [illegible] with picks and shovels, digging in search of [illegible] of the strategic mineral.

In town [illegible] worked in [illegible] sorting, trimming, and grading the sheet on high-quality mica.

Now that the demand has dropped, Governador Valadares again dozes.

From this rural center I returned by plane to Belo Horizonte, seeing long hours on a jiggling, swaying seat.

Airlines also have simplified the trip to Diamantina and Montes Claros in northern Minas. A railroad extends northward, but trains travel slowly.

Site of Eclipse Expedition

Last year [illegible] of the [illegible] Army Air Forces-National Geographic Society Expedition [illegible] Bocaiúva, near Montes Claros, to study the eclipse of the sun. [illegible] of their equipment was flown to the place.*

[illegible] between Sete Lagoas, Seven Lakes, and Curvelo, I [illegible].

[illegible] quartz [illegible] the [illegible] of [illegible] minerals. But [illegible] are the large plain [illegible] to Brazil [illegible] "Brazilian pebbles" [illegible].

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* See "[illegible]," by F. [illegible], in the National Geographic Magazine, [illegible].

[illegible] by W. Robert Moore, National Geographic Magazine, [illegible].

A Shovel Brigade Tosses Out Dirt from This Quartz Mine near Sete Lagoas

This Single Huge Crystal of Quartz Weighs Five Tons!

[illegible]

Even so, only a fraction of the quartz is of quality sufficiently free from stains, fractures, and cloudiness to be of value for scientific use.

Quartz is piezoelectric—it generates a measurable electric potential when placed under stress. Because of this property, quartz-plate oscillators serve as the keystone in radio wave control and in numerous detection devices.

During the war huge quantities of quartz were [illegible] Mineiros feverishly sought for small, medium, and large crystals. Some of the mines looked like prehistoric cliff dwellers' holes, projects or [illegible] of a giant. When war demand for crystals ceased, many miners have returned to farming or gold panning.

Home of *Homo brasiliensis*

Prehistoric men once dwelt in this part of Minas. They lived in limestone caves near Lagoa Santa on the way to Sete Lagoas. Dr. Peter W. Lund, a Danish scientist, [illegible] unearthed bones [illegible] the famous Lagoa Santa man, *Homo brasiliensis*.

In Belo Horizonte Mr. H. V. Walter, the British consul, showed me the results of the [illegible] "Cerca Grande" [illegible] which he [illegible] in this same area.

Among Mr. Walter's [illegible] made trophies are [illegible] teeth and tusks of a mastodon, bones of the [illegible] an extinct horse [illegible].

He also has [illegible] giant sloths, a fossil armadillo, and [illegible] beads, pipes, and arrow points used by primitive man.

Diamantina, 150 miles north of Belo Horizonte, [illegible] stained and [illegible] [illegible] were taken from the Crown after their discovery in the early 1700s [illegible] treasure [illegible] jewels [illegible].

The Portuguese [illegible] between 1740 and 1771 [illegible] were mined. From then until [illegible] the output [illegible] a year.

Diamantina still produces diamonds, though not on such a casual or prodigal scale as it once did.

Other [illegible] have been made in Brazil all the way from Amazonas to Paraná. Research

"Brazilian Pebbles," Some Miners Call These Crystals of Pure Quartz

[illegible]

[illegible] the western part of the State. Minas [illegible] in Brazilian production.

During my stay in Rio Horizonte I saw and photographed [illegible] brought in the Rio Paranaiba district. [illegible]

[illegible] Minas [illegible] Diamantina [illegible]

Many of the diamond bearing [illegible] in the [illegible] from [illegible] Diamantina [illegible] Minas.

[illegible] Brazilian [illegible] "Estrela do Sul" (Southern Star), 261.88 carats; the "Star of Minas," 179.3 carats; and the English Dresden Diamond [illegible] Minas.

[illegible] Brazilian [illegible]

"Wild West" a Cattle Country

The "wild West" of Minas is also rich [illegible] Uberaba [illegible] Zebu [illegible] Every year Uberaba holds a live-stock fair.

During the war years [illegible] high-priced [illegible] A [illegible] of high registry might sell from $25,000 to $50,000 or even more.

[illegible] "Banks" parading on four legs.

I journeyed out to a fine old [illegible] ranch northwest of Rio Horizonte [illegible]

"Is That Rope You're Smoking?" Is No Joke in Rural Brazil

[illegible]

[illegible] Hundreds of [illegible] and [illegible]

The [illegible]

The State's Model Farm

Out near Pará de Minas I also visited the State's model farm, the Fazenda [illegible]

Farm lads come here to take short courses in agronomy. Farmers from all over the state are invited to visit the school and to inspect the farm improvements. A [illegible] [illegible]

[illegible]

In the farm buildings are [illegible] machines for making cheese and other [illegible] products, a mill for [illegible]

[illegible]

[illegible]

route to go to Ouro Prêto. Traveling by car, we rolled up and down the roller-coaster mountain road and twisted around the sharp kinks of the Rio das Velhas.

On the way I saw several small tea plantations. Later I found some of the packaged tea in Ouro Prêto labeled "The Tea of India"!

Just short of Ouro Prêto, we came to Saramenha where the Electro-Quimica Brasileira S. A. built a new industrial plant during the war. Briefly it produced aluminum from the extensive bauxite deposits in the vicinity. Now it manufactures sulphuric acid, copper sulphate, and ferromanganese.

Ouro Prêto, City of Cities

From this plant of today you travel backward into yesterday as you ride the last three or four miles into Ouro Prêto. Except for a single modern hotel, you step straight into the 18th century.

Here is the city of cities in Minas Gerais. No other spot in the state is crowded with more memories, history, and early colonial architecture.

Ouro Prêto (Black Gold) is a museum town in feeling and fact. In the first years of the 1700's it was called Vila Rica (Rich Town). And rich it was from all the gold garnered from the locality. When the golden sands ran out, so did the town's prosperity.

Since then hardly a worn stone in its rough cobbled streets has been changed. People still live here—some 60,000 in the district—but they've done little to alter its colonial appearance. And now, while not yet too late, the Government has declared Ouro Prêto a national monument—a living museum (page 492).

Venerable churches stand like beacons on its numerous hills. Thick-walled balconied houses seem to cascade down the steep slopes. Weathered stone bridges still carry traffic over the streams.

At nightfall in the crooked lanes it takes little imagination to picture the crippled sculptor, Aleijadinho (page 481), slinking out of his house to his sedan chair. Borne by slaves to one of these white churches, he worked, at night, chiseling soapstone doorways, altars, and fonts.

Thus in his later days he labored, avoiding everyone. And thus he was carried to an altar of his own carving to die when a dread disease had mutilated his body.

Ouro Prêto's churches are rich shrines. During these Holy Week celebrations several alternately hold elaborate religious rites (pages 490-7-8, 501).

Crowds congregate to watch the ceremony of washing the feet, to gaze at dramatic scenes of the Passion, and to join in the long street processions.

This week of rites, though less ordered than the Passion plays of Europe, is deeply impressive.

"Tooth Puller," Martyr to Freedom

Tiradentes Day is still another highlight for Ouro Prêto, for here lived the first outstanding martyr in the cause for Brazilian freedom.

Back in 1789 one Visconde de Barbacena came as Captain General of the mines. He stirred up much resentment for himself and Portugal by collecting heavy taxes and the full measure of the King's royal fifth.

A small band of influential men and priests started a conspiracy to rid the place of Portuguese authority and form a republic. Among them was a young dentist, Alferes de Cavalaria Joaquim José de Silva Xavier, or, briefly, Tiradentes, the "Tooth Puller."

With zeal as strong as his name was long, Tiradentes shouldered responsibility when the plan failed. His hanging in Rio was like a Roman holiday. Royalists laughed at his execution; the downtrodden wept. Most of Tiradentes's collaborators were exiled to Africa.

But the Brazilians didn't forget.

In the center of the Praça stands a statue of the Tooth Puller. The former penitentiary at one end of the square now has been converted into a museum of the Inconfidência (those "Unfaithfuls" who were the first Brazilian patriots).

The Governor's Palace at the opposite end of the square today houses the School of Mines. I had guides galore all the time I was in town, as the students all wanted to practice their English!

The old colonial Casa dos Contos, once the mint and office of the superintendent of gold production, now is the local post office.

One of Ouro Prêto's outlying churches, Santa Ingenia, recalls the fascinating tale of "Chico Rei."

Chico Rei was an African chieftain who with his family and members of his tribe, was sent as a slave to dig in the gold mines. Working hard at many odd-time jobs, he managed to save enough money to purchase his freedom. Later he freed his son, and together they progressively bought release for others.

Chico, or Francisco, set himself up as "king" of his little colony and made his son prince.

These people built the church and once each

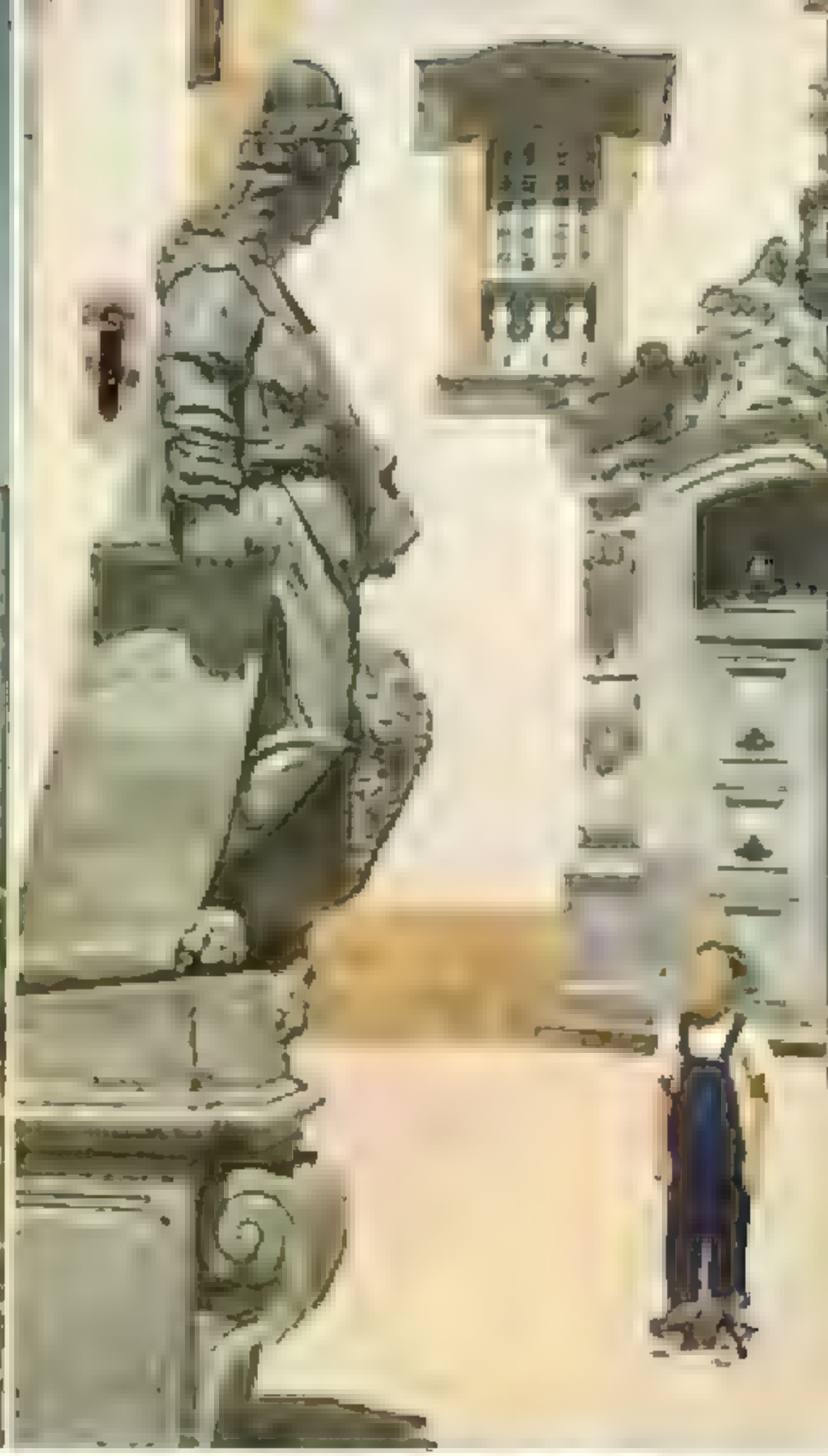
A Fabulous City of Skyscrapers Soars above the Brazilian Plateau—Belo Horizonte

A Booming Goldfish Town in Portuguese Daos, Once Picto, Now Is a Colonial Showcase

Bela Horizonte's Sports Center. Built with Lottery Funds, Trains Brazilian Swimmer Champions

Donkeys Laden with Farm Produce, Instead of Gold, is in Colonial Days, Plod Past Purple Jacaranda Trees near Tabacote.

Slowly, with Picks and Shovels, Road Builders Whittle Away Large Peaks or Mountains of Solid Iron Ore Overlooking Balmoral

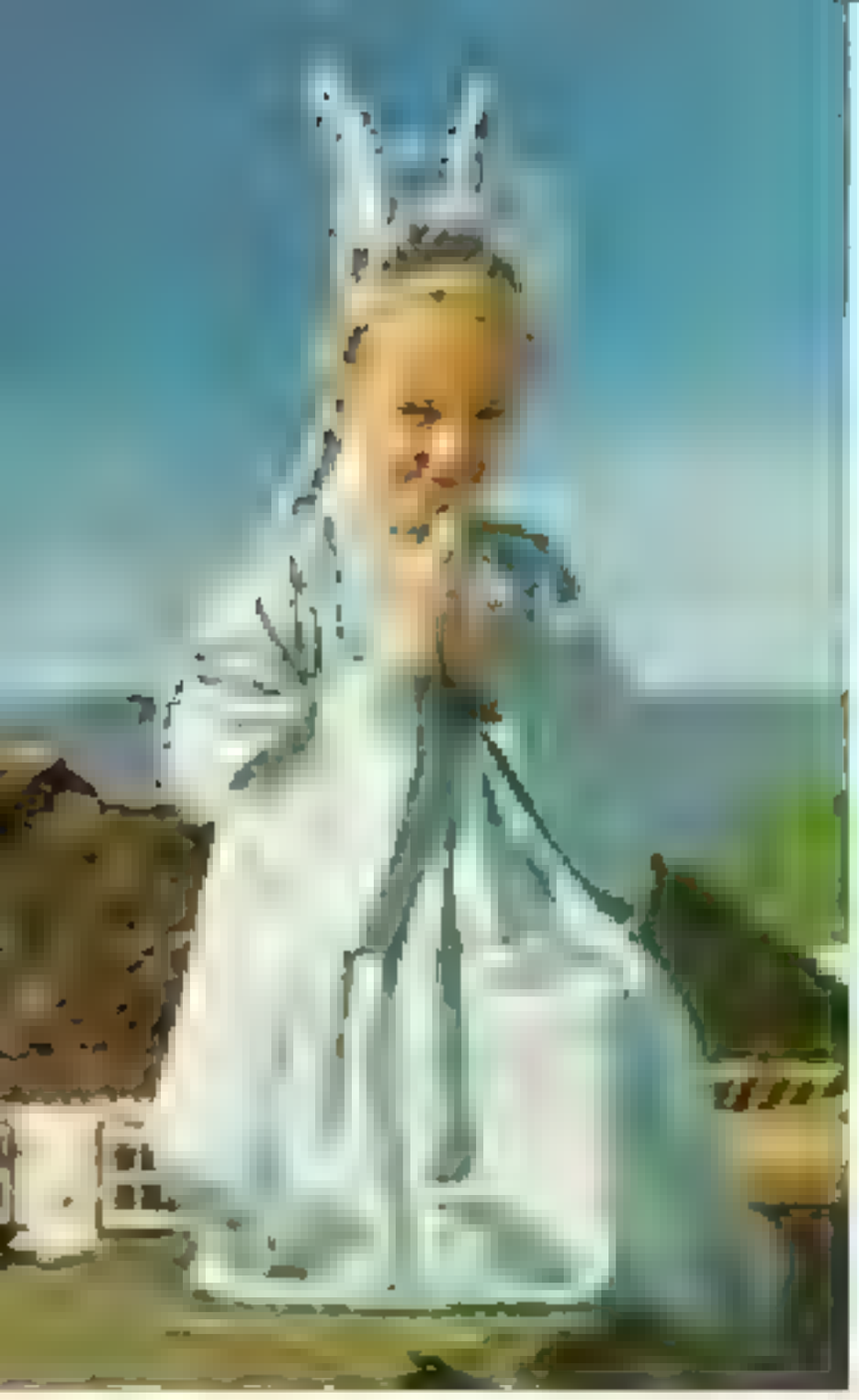


Elaborate Doorways, Medallions, and Images, Carved in Stone, by the Crippled Giants, Mendadinho Aleijadinho, Gerais, Brazil

Priests, Acolytes, and "Angels," in Bright Array, March in a Holy Week Procession at Ouro Preto

[illegible] the old Minas Geraes capital for the annual church festival

[illegible]



Tours to the Forest Nigeria in the Easter Parade

A Phantom Head Pocket Large Monoliths Press Bearing Skyward Like Giant Antlers

[illegible] between the Moonscape [illegible] Buildings of Cappadocia Turkey

Beside a Locust Tree in Full Bloom, Fair New Mexico! Homes Nestle among Geotheritic Hills Between Ojito Peak and Marcana

Upon Press's Younger Set, Members of El Tesoro Club, Brighten Holy Week with a Costume Parade

Take Away the Palm Trees and This Might Be Central Park in New York, Not in Rio (Horizonte)

Mosaic Sidewalks Recall Portuguese Heritage

A Sedan Chair Is Nice but Still Takes a Convertible

Wm. Rubes Tarp from the Earth, Bird Horizontal Shots Film Churches, Skyscrapers, and Apartment Houses

Three Times Daily, the Capitol's Movie Theatres Send Cluttering Crowds onto the Mesquite Sidewalks

Old Dessie Bass and a Blossoming Arrow at Gray Stones Represent Two Major Sources of Miss Cassie' Wealth

year held a "royal" procession to attend High Mass. Following this, everyone danced in the streets to the tom-tomming music of African instruments.

As dowdbars, legend has it, the Negresses washed gold dust from their hair into the stone basin at the entrance of the church.

It seems an odd twist of circumstance that Ouro Prêto, whose very name and early fortunes were gained from its gold mining, now should have as its chief industry the mining of "fool's gold," iron pyrites.

Just outside town is an extensive 250-foot thick layer of pyrites. The mine was opened in 1935 and was expanded during the war to furnish sulphur for Government munition plants.

A few miles east of Ouro Prêto, on the road to the historic mining town of Mariana, one gold mine still functions.

Mariana, like Ouro Prêto, is filled with ornate churches. The town was the seat of the first bishopric and archbishopric of Minas Gerais and still is a strong religious center.

A Souvenir Town of Colonial Days

Among souvenir towns dating from colonial days, few are more striking than the tiny hamlet of Congonhas do Campo, some miles west of Ouro Prêto.

It stands on a hill like a light that cannot be hid, with the sanctuary of Senhor Bom Jesús de Matosinhos capping its crest. Up toward this shrine the houses straggle in irregular ranks on either side of tortuous rock-paved streets.

In the mid 1700's a Portuguese hermit, Fericiano Mendes, wandered about the countryside carrying a portable altar and an alms box. He had vowed to build a church with the money he collected.

His altar and alms box now hang on one of the church walls—eloquent testimony of the church's humble beginning. To Aleijadinho is credited its ultimate in decoration.

Doorways and altars were carved by him or his assistants, and the terrace is surrounded by huge figures of the Prophets carved in locally mined soapstone (page 490).

Small chapels flank either side of the hill approach, housing 14 elaborately carved and painted wooden figures that represent scenes of the Passion. These, too, are said to be the masterly handiwork of Aleijadinho and his helpers.

Each year, in September, thousands of persons flock here on pilgrimage and crowd the village.

The whole countryside roundabout is rich in iron and manganese deposits. As you come by train south from Belo Horizonte you see big piles of iron and manganese ore at siding.

At Lafaiete, a few miles farther south, the Cia. Meridional de Mineração, a subsidiary of United States Steel, has tipped away the whole top of a hill, Morro da Mina, to unearth its manganese.

Since operations were first begun here, in 1902, by an earlier company, the old hill has yielded some 5,000,000 tons of ore.

A Land of Spas

Ask for a bottle of mineral water in Brazil and the chances are high that you get another product of this Mineral State. The bottle may bear the label of Caxambú or São Lourenço.

These are but two of the several spas scattered through southern Minas that are noted for their thermal and mineral waters and health baths.

So popular is the large spa of Poços de Caldas (Pools of Hot Springs) that an air service links it with Rio and São Paulo. Brazilians and many other visitors from Latin America come here to benefit by its hot sulphur waters and mud baths.

Surpassing Poços de Caldas in the outlay of its buildings is Araxá, east of Uberaba. For some years this remote interior town was a modest resort. Recently, millions of dollars were spent in building luxurious hotels and baths to exploit its warm sulphur baths and waters.

The Manchester of Brazil

Near the southern edge of Minas on the main line from Belo to Rio de Janeiro is Juiz de Fora, a busy industrial center. "Manchester of Brazil" the people like to call it, because of its textile mills and factories.

Twice before in earlier days the Mineiros tried their hand at making textiles. Both times they were successful—too successful.

The first attempt followed the collapse of the early gold-mining booms. On crude looms folk here began producing cotton fabrics and developed a sizable trade with other sections of the country. Portugal quashed that by stringent laws, allowing them to make only coarse sacking for Negroes.

Again, when Brazilian ports were opened to foreign trade, the Mineiros set up their looms. But not for long. A treaty between Britain and Portugal carried a restrictive clause against Brazilian textiles.

The third start was made in 1864 by two Mascarenhas brothers.

Perhaps as fascinating as the growth of the Brazilian textile trade since then is the

As in Early Gold-rush Days in Minas, They Pan Alluvial Sands for Nuggets

[illegible] a few flakes, worth more than a dollar, for their day's work. Despite small but [illegible] large or irregular nuggets as much prized as more [illegible] gold dust. The lofty work [illegible] the historic mining centers. (page 44)

long story of the Mascarenhas family itself.

The story begins in 1778 when 10-year-old Antonio Gonçalves Mascarenhas arrived in Rio de Janeiro from Portugal. In his pocket he carried [illegible] from the sale of the [illegible] his parents.

[illegible] he fell in with a *tropeiro*, the owner of a [illegible] train and joined him in wandering [illegible] Minas Gerais, bartering merchandise for metal products.

On one of their trips they came upon an [illegible] by the wayside. It was St. Joaquim's Day; so what better than to name her Joaquina Maria da Conceição.

Thus Joaquina was [illegible] by the tropeiro and accompanied them on their journeys. In the fullness of time, Antonio married her.

The old tropeiro retired, but Antonio and Joaquina carried on.

Three sons were born on the trail.

When the young[illegible] child, also named Antonio, was only nine, the parents were stricken with smallpox. Slaves stole the mules, gold and money, and abandoned the young [illegible]

He rare [illegible] from found them and took [illegible] fazenda.

One south went with the tropeiros; the second ran away and died. Little Antonio, however, was made of sturdy stuff.

He lived sanitily, grew up, and eventually married the daughter of a wealthy cattleman. [illegible] prospered.

Two of these brothers [illegible] founded [illegible] textile industry in Minas and laid the foundations for the honored house of Mascarenhas.

It is such human resourcefulness, coupled with rich natural resources, that today is rapidly widening the State's horizons.*

* For additional articles on Brazil see "National Geographic Magazine Cumulative Index" [illegible]

Exploring Aleutian Volcanoes

By G. D. Robinson *

ON JUNE 6, 1945, when the war against Japan was approaching its climax, a telephone call came for me at my hotel in Anchorage, Alaska, where I was outfitting for a geologic mission in the interior.

There was a note of urgency in the voice of the caller, a colonel on the staff of Lt. Gen. Delos C. Emmons, then Commanding General of the Alaskan Department.

"A volcano is erupting near Fort Glenn, on Umnak Island, one of our big Aleutian bases," he said. "We are afraid it may blow off its top at any time and destroy the base. General Emmons wants a geologist to fly out and see if the base is in real danger."

Fort Glenn was then an important airbase and in addition a large force of troops was concentrated there for a projected invasion of the Kuril Islands, northeast of Japan proper.

To evacuate so large a force on short notice might result in loss of life. Since there is no harbor near Fort Glenn, it could be done only by ferrying the troops in barges through rough seas out to transports lying offshore.

Geologists, I told the colonel, had been studying volcanoes for many decades, but had not made much progress toward predicting eruptions. There was little chance that I could outguess a volcano which had never been studied, particularly since my knowledge of volcanoes was rather sketchy.

No volcanologist was available for the job, however; so within an hour I was on the way to Umnak by air, armed with a geologic hammer, a camera with one roll of film, a high-temperature thermometer hurriedly wrenched from a B-29 (for taking the temperature of volcanic gases or lava), and a general sinking feeling.

Although this was to be my first encounter with an active volcano, it was not the first such experience for General Emmons.

Mighty Eruption of Mount Katmai

Exactly 33 years earlier—on June 6, 1912—General Emmons, then a young lieutenant, had been on a ship in Shelikof Strait between Kodiak Island and the Alaskan mainland. Suddenly an immense dark cloud had swept in from the west, blotting out the sky, and a rain of still-warm volcanic ash poured down on the ship, threatening to sink it and suffocate its passengers.

This was the eruption of Mount Katmai in which 4½ cubic miles of volcanic ash was belched forth, spreading over thousands of square miles. In this eruption was born the famous "Valley of Ten Thousand Smokes."†

Perhaps, also, General Emmons remembered the frightful eruption of Mount Pelee in Martinique, in 1902, in which 28,000 people perished,‡ and the explosion of Krakatau, a volcanic island in the Netherlands Indies, in 1883, which caused a tidal wave that snuffed out the lives of 36,000.

Closer to home, though much less destructive, was the eruption in 1944 of Mount Cleveland at Chagulak Island, less than 100 miles from Fort Glenn. This eruption killed one soldier of a small detachment stationed there and caused the outpost to be abandoned.

Skyscraper Volcano of the Aleutians

As we flew along the Alaska Peninsula and out over the eastern end of the Aleutians, clouds rising to about 9,000 feet hid all but the highest peaks.

Cavalo Volcano on the Peninsula was mildly active, emitting puffs of black ash and steam at about one-minute intervals (page 512). A steam plume rose from Shishaldin, nearly 10,000 feet high, tallest volcano in the Aleutians (page 513).

Umnak Island was shrouded in cloud as we approached.§ Mingling with the white-and-gray atmospheric clouds but easily distinguished from them was a broad, ragged mass of black ash cloud, attesting to volcanic activity on the ground hidden below.

As our plane dicked into the clouds and began circling for an instrument landing, we lost sight of the ash cloud. When we came down on the Fort Glenn field there was no sign through the fog and oncoming night that a volcano was erupting vigorously only 10 miles away.

Earth tremors accompanying the eruption had been felt only rarely and faintly at this

* Mr. Robinson is a geologist on the staff of the U. S. Geological Survey and is acting in charge of the Survey's volcano investigations. Published by permission of the Director, U. S. Geological Survey.

† See, on the National Geographic Magazine, articles on the Valley of Ten Thousand Smokes in the issues for January, 1917; February, 1918; and September, 1918, all by Robert F. Griggs, and April, 1919. Also "Volcanoes of Alaska," by Capt. K. W. Perry, August, 1912, and "Recent Eruptions of Katmai Volcano in Alaska," by George C. Martin, February, 1915.

‡ See, in the National Geographic Magazine, by Israel C. Russell, "Recent Volcanic Eruptions in the West Indies," July, 1902, and "Volcanic Eruptions on Martinique and St. Vincent," December, 1902.

§ See "Navy Artist Paints the Aleutians," by Mason Sutherland, NATIONAL GEOGRAPHIC MAGAZINE, August, 1945.

Men Crossing Ashe-covered Snow Fields Inside Okmok Crater Seem Dwarfed by Eruptions

distance, according to Lt. Col. O. J. Mussman, the fort commander, so I began to feel somewhat happier about the situation.

If the volcano had been erupting freely for several days, as reports of flyers seemed to indicate, and the eruption was not accompanied by strong earthquakes, it seemed reasonable to suppose that the volcanic forces were being released about as fast as they were accumulating and that a major outburst was not to be expected.

Next morning a small party in two "weasels" set out for the volcano.

The excellent topographic maps of the Army Corps of Engineers indicated that the northeast end of Umnak Island was essentially a single volcano about 25 miles in diameter at sea level, and that the summit was occupied by a huge, steep-walled, flat-floored crater almost circular and as much as seven miles across, with its rim 2,900 to 3,500 feet above sea level. Craters of this type are called calderas by geologists.

This huge volcano is known by its native name—Okmok. Rising on the southeast flank of Okmok Volcano is Mount Tulik, a long-dormant parasitic cone 4,111 feet high and the tallest peak on northeastern Umnak.

The maps showed about 10 large and many small volcanic cones on the caldera floor, 1,500 to 2,500 feet below the rim. Since flyers' reports indicated that one of the cones in the southwest sector of the caldera was erupting, we headed in that direction.

Fog Hides Eruption

We climbed in blinding snow and fog to the rim, but could see nothing inside (nor anywhere else), although we could hear a steady bellowing roar broken by surging and splashing noises. So we returned to the fort.

Next day we approached the caldera by jeep and on foot from the northeast, where the rim is broken by the canyon of Crater Creek, only outlet for the water which falls into the caldera (page 517).

The waters of the creek were clear and barely above freezing, indicating that lava was not flowing or ash being deposited in the northeastern sector.

A herd of caribou, which usually winter in the caldera until July or August, were wandering about on the tundra near Crater Creek, apparently having been frightened out of their winter home by the eruption. The caldera was still nearly filled with fog and low clouds, but from the rim we could dimly make out eruption clouds rising several miles away.

That night I discovered that the Army, without knowing it, had a well-qualified volcanologist on the ground at Fort Glenn! He was Lt. Ray E. Wilcox, who was at the fort installing special signal equipment. Before the war he had specialized in volcano research.

Wilcox had heard only that a nearby volcano was erupting and therefore had not come forward to offer his services. I was glad to find a geologist with a more thorough knowledge of volcanoes, and we joined forces.

On the morning of June 10 the fog and clouds at last lifted. From the fort a column of white steam, at times darkened by ash, could be seen rising above the caldera. Our weasel caravan was reassembled, and we retraced our route of three days earlier.

When we left the weasels and walked toward the rim, our feet sank through two inches of newly fallen black volcanic ash and left white prints in the snow beneath (page 516).

As we stood on the rim we were treated to an awesome spectacle. Billowing black and white clouds, rolling majestically upward from the summit crater of a cone less than a mile away and about 500 feet below us, extended far over our heads. As the clouds rose above the rim, a strong north wind swept them to the south, showering the outer slopes and us with fine ash.

A steady roar, like that of a railroad locomotive at the far end of a long tunnel, was punctuated every 10 to 15 seconds by a violent explosion which threw red-hot blobs of lava more than a thousand feet above the cone. The larger lava masses, or volcanic bombs, so named because they resemble projectiles, fell back into the vent or rolled down the slopes of the cone; the smaller fragments were thrown farther and fell on the caldera floor.

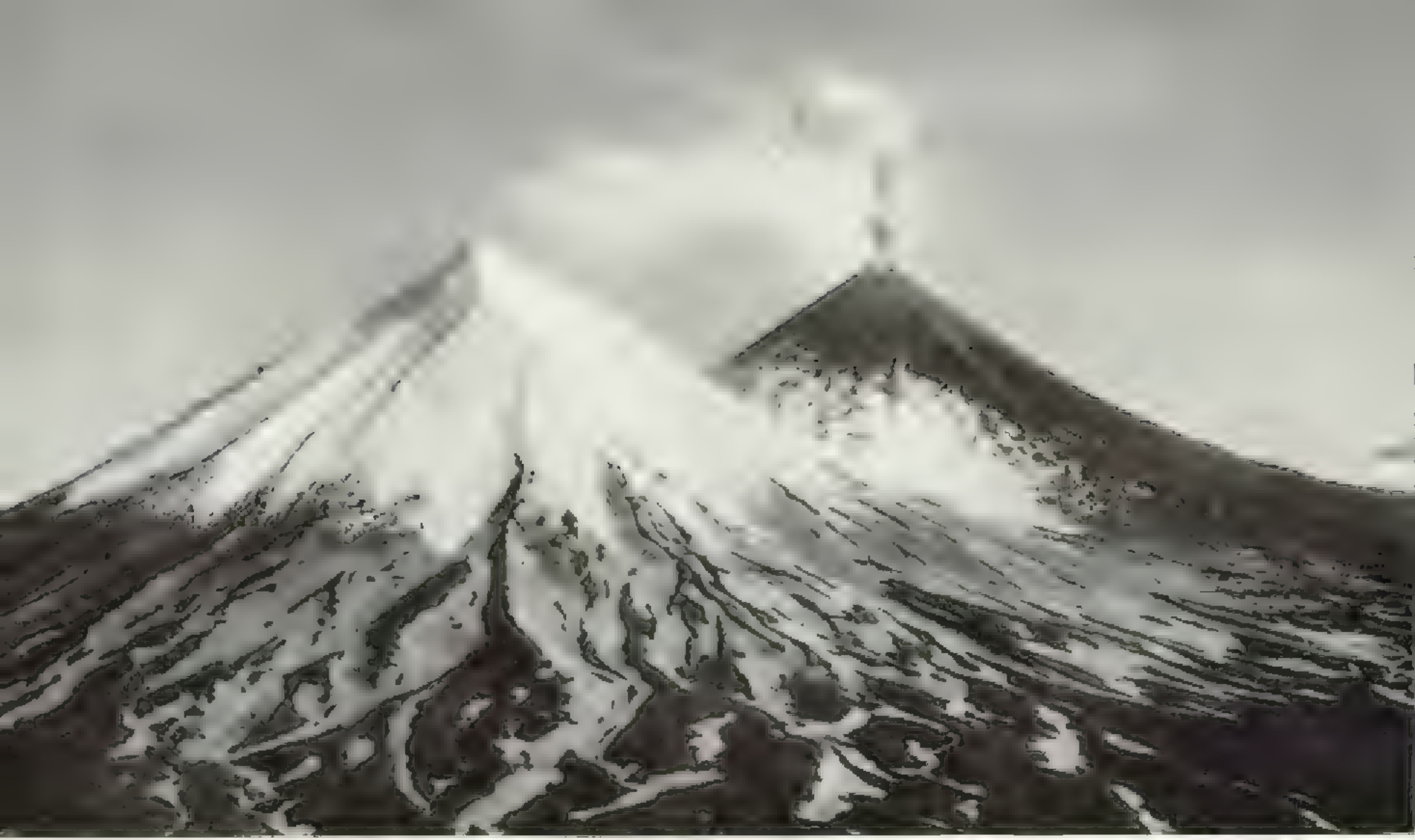
About once a minute there was a particularly violent explosion in which bombs, some several feet long, were thrown far out on the caldera floor.

On the topographic map the active cone was shown as about 400 feet high, rather sharp-topped and nearly 100 feet lower than one joining it to the northwest; now, after a few days' eruption, it had built itself higher than its dormant neighbor and had developed a broad, shallow crater.

A Glowing Red Lava Fall

A stream of lava, glowing red even in the bright sunlight, issued from a fissure in the southwest base of the cone, poured over a cliff as a "lava fall," and formed down a depression to the northeast toward the center of the caldera. The flow was then about [illegible]

Another smaller tongue of lava was moving



Pinkut, 8,700 Feet (Left), Nikon, and Pinkut Sister (7,700), Are Famous Landmarks of the Alaskan Volcanic System

Resembling the Perfect Cone of Japan's Fuji-Shushinzan, Unlike Aleutian Volcanoes, Usually a Cloud Plume Issues Its Snow-capped Peak

west into a shallow depression. Dense clouds of steam marked the edges of the flowing lava as it melted the ice of the little glacier which occupied this part of the caldera floor. Its ability to melt ice was considerable, as its temperature was nearly 2,000° F.

Climbing and sliding down into the caldera, we found the lava stream was flowing 30 to 40 feet a minute. Its surface was partly crusted over, and the floating chunks of crust jostled each other with a peculiar rattling noise. We amused ourselves by throwing heavy lava bombs into the flowing lava and watching them float away like rocks.

Near the lava vent were three miniature volcanoes only a few feet high, throwing innumerable blobs of bright orange-hot lava into the air like many-armed jugglers and giving off, with a high-pitched hiss, large volumes of faintly bluish gases. The sides of the tiny volcanoes were spectacularly colored with white, yellow, orange, and red deposits made by the rising gases.

All this indicated that dangerous pressures were probably not being built up inside the volcano, and we reported to General Emmons that there was little risk of a disastrous eruption. That conclusion was bolstered by the fact that the crater of Okmok Volcano is a caldera, for most calderas are formed in such a way as to provide natural "safety valves" and lessen danger of catastrophic eruptions.

Calderas, such as that of Okmok, usually come into being when vast amounts of molten rock, mostly transformed by internal gas pressure into ash and pumice, are erupted through the central vent of a large volcanic cone, removing support from the upper part of the volcano.

Part of the volcano's top is perhaps blown away in the eruption, but most of it collapses in a jumble of broken blocks, as the upper crust of a pie might do if the filling were suddenly removed.

Later, lava and fragmental material erupt through the cracks between the blocks of the fallen "roof," building small volcanoes on part of the floor and leveling off the rest of it. Crater Lake in Oregon is a well-known caldera formed in this manner and later filled in with rain water and snow.*

Calderas in the Aleutian Arc

Calderas, rather rare elsewhere, are remarkably numerous in the Aleutian Arc.

The chain contains no fewer than 10 calderas a mile or more across, and at least five with diameters of five miles or more. Others probably will be discovered as exploration proceeds.

There are more calderas in the Aleutian Arc than in any other known volcanic chain, with the possible exception of the southern islands of Japan.

Best known of Aleutian calderas is Aniakchak, 5½ to 6½ miles across and 1,200 to 3,000 feet deep, on the Alaska Peninsula, discovered by W. R. Smith and R. H. Sargent of the Geological Survey in 1922.

The crater of Mount Katmai, enlarged by the great eruption of 1912 to a width of nearly three miles and a depth of 2,700 to 3,700 feet, is a well-formed caldera though not exceptionally large.

Once a caldera is formed, there is little

* See "Crater Lake and Yosemite Through the Ages," by Wallace W. Atwood, Jr., NATIONAL GEOGRAPHIC MAGAZINE, March, 1937.

chance of another catastrophic explosion, for if a mass of magma (molten rock) should rise up beneath the fallen roof from deep within the volcano, the cracks and fractures in the fallen material would ordinarily provide an easy means of escape for gases that might otherwise accumulate sufficiently to produce a major outburst as the magma cooled.

That was apparently what was happening in the Okmok caldera (page 524). Since the gases were escaping and lava flowing freely, it was not likely that great pressures were being built up.

A few days later Dr. Howel Williams of the University of California, an expert volcanologist, arrived and confirmed our prediction. Fortunately, the volcano also confirmed it, although lava continued to flow until some time in September, the main flow finally reaching a length of nearly five miles. Mildly explosive activity continued intermittently until December. Today the cone is steaming quietly but giving no other sign of activity.

This 1945 eruption of Okmok Volcano might have ended much differently, perhaps taking many lives and interfering with our air attacks on Japan. Because of its nearness to Fort Glenn, the eruption focused attention on how vulnerable the military and civilian establishments in the Aleutian region are to destructive volcanic activity, and emphasized the deplorable scarcity of geologic information on the entire area.

Aleutian Volcanoes Form a Chain 1,600 Miles Long

Extending along the Alaska Peninsula and through the Islands, the system includes about 40 large volcanoes and scores of small cones. This is one of the world's most active volcanic regions.

Hoped for Safety, Geologists Prepare for a Close-up Look at Okmok Volcano

[illegible] rope [illegible] and the author. The picture was taken by [illegible] who went as far [illegible]

With [illegible] a large [illegible] of the Aleutian [illegible] 1945, by the [illegible] supported by the [illegible] Department of the Army [illegible] the Office of Naval Research.

A Long-range Study of Volcanoes

[illegible]

[illegible]

In the Aleutians Nature has provided a tremendous volcanic laboratory, for [illegible] fact the Aleutian region is one of the most active volcanic belts on earth.

The Aleutian Islands [illegible] large and small islands [illegible] extending westward from the tip of the Alaska Peninsula [illegible]

[illegible]

[illegible]

[illegible]

Frank M. Setzer, Jr., Photo

If Your Muscle, Wind, and Nerve Are Good, You Can Cross "Blinker Bridge"!

Members of a field party studying Cinder Volcano moved this rope across Crater Creek and crossed in this position under their own muscle power. It was the only safe way to cross the stream at this point, since the current is dangerously swift and the temperature of the water close to freezing. In the background are the cliffs of Crater Creek. Bears go out from Ohmer's cabin.

of the volcanoes of this 1,030-mile chain, which is called the Aleutian Arc.

Records of eruptions of the Aleutian volcanoes date to 1760, shortly after Russian explorers and traders began coming to the region, but many eruptions undoubtedly have not been recorded. A few volcanoes on the mainland have been examined briefly, lately by the Geological Survey, and the Valley of Ten Thousand Smokes has been studied in a series of seven expeditions sponsored by the National Geographic Society.*

Aleutian Arc Peppered with Volcanoes

We now know that the Aleutian Arc contains about 80 large distinct mountains known or believed to be volcanoes, from 1,000 to 10,000 feet high, as well as scores of small volcanic cones, some of which are still being [illegible] by volcanic activity. Others are [illegible] and are being eroded away by [illegible] since 1760 at least 39 different Aleutian volcanoes have been reported active, some many times. About 225 eruptions are recorded, ranging from quiet discharges of steam and "smoke" (really ash-laden steam) and minor explosive eruptions often accompanied by lava flows to major catastrophic eruptions such as that of Mount Katmai in 1912.

Analysis of the incomplete records indicates that volcanic activity in the Aleutians follows major cycles of roughly 80 years, with minor cycles of about 20. Apparently the chain is now in the inactive part of a cycle. If this interpretation is correct, activity should mount to a climax again in the late 1980's.

Most active of the Aleutian volcanoes, according to the records, are Pavlof Volcano on the Alaska Peninsula, Shishaldin Volcano on

* For list of articles on the Valley of Ten Thousand Smokes, see footnote on page [illegible]

H. D. Robinson, Photo.

Trail in Novarupta Volcanic Ash Marks Geologists' Route down into Okmok Caldera

[illegible] trail [illegible] field on its floor, heading toward the active cone. One man stops to photograph those ahead.

Unimak Island, and Makushin Volcano on Unalaska Island overlooking Dutch Harbor.*

The "Disappearing Island"

Most famous of all Aleutian volcanoes is the "disappearing" island of Bogoslof, which seemingly has risen from and sunk into the sea several times since its first recorded appearance in 1796.†

Bogoslof is apparently the top of a nearly submerged volcano rising 5,000 feet from the ocean floor. It is eight miles in diameter at its base. The strange antics of Bogoslof are caused by eruptions of this volcano, building islands above the water which are promptly attacked by wind and waves and rapidly worn away, or destroyed by later explosive eruptions.

Innumerable sea birds nest there, and between 5,000 and 10,000 sea lions live in the near-by ocean. Its topography has been changed frequently by eruptions since 1796, in 1883, 1906, 1910, and almost continuously from 1923 to 1927.

Many intriguing problems arise as the study of Aleutian volcanoes proceeds. For example, why do some of the large volcanoes have no glaciers on their slopes, while others, no larger, have heavy ice caps? Perhaps eruptions have interfered with the formation of glaciers. Mountain glaciers seem to require years for their formation; the frequent deposition of ash and lava may keep the slopes smooth and prevent basins from forming.

Still unexplained, too, is why the active volcanic vents of the Aleutians gradually have migrated from the Pacific Ocean side of the island chain to the Bering Sea side.

Absence of Trees a Mystery

Another Aleutian mystery, probably only remotely related to the volcanoes, is the nearly complete absence of trees.

Forests grew on at least part of the islands and on the Alaska Peninsula millions of years ago in the late Tertiary geologic period, as we know from fossil tree trunks that have been unearthed. Except for a few thickets of undersized willow and alder, no trees grow there naturally today, though the climate is comparatively mild with plentiful rain and good soil.

Two small groves of Sitka spruce planted on Amaknak and Expedition Islands in Unalaska Bay more than 100 years ago have survived but not flourished; some trees planted recently by the Army have thrived, but more have failed.

Perhaps the strong and long-continued winds offer an explanation. If so, then the absence of such winds in the geologic past must be accounted for.

In the inhospitable climate of the Aleutians, with its high winds, frequent fog, sudden storms, and constantly rough seas, geologic field work is practicable only during the three months of summer. Even then, bad weather may at times permit as little as half a day's field work in three weeks, and snow storms or fogs may suddenly shut off visibility on days that start out with clear skies and sunshine.

Most areas are wide of roads or landing beaches, and foot travel is often difficult and dangerous, though not more so than geologists meet in other places.

Especially on the smaller islands, slopes are steep from the water's edge. On the larger islands and the mainland, broad, swampy tundra separates the volcanoes from the seas and from each other. Treacherous glacial streams, icy, swift, and given to sudden shifts in course and volume—must often be crossed, and at higher altitudes the glaciers themselves contain dangerous crevasses and ice cliffs.

On the Alaska Peninsula and on Unimak, easternmost of the Aleutians, bad weather and difficult terrain are not the only complications, for these areas are inhabited by the great Alaskan brown bear, which sometimes stands 9 feet high erect and weighs 1,500 pounds.‡

But for the geologist there are compensations for the hardships. The few clear, warm days are especially enjoyable because of their rarity. During the summer months there are few uncomfortably cold days and no uncomfortably hot ones.

The amazing profusion of sea birds, including ebony crests, arctic terns, albatrosses, petrels, puffins, and auklets, of animals such as foxes, sea otters, seals, sea lions, whales, dolphins, and porpoises, and of flowering plants§ is a constant source of pleasure.

The absence of trees and underbrush, though giving many areas a forbidding and gloomy appearance, makes for easier travel and plentiful exposures of rocks for the geologist to study (page 527).

In three summers of geologic work our men have made at least preliminary surveys of most

* See "Magnificent Home of the Great Brown Bear (The Society's Part of Aleutian Expedition)," by T. A. Jaggar, NATIONAL GEOGRAPHIC MAGAZINE, January, 1934.

† See "Back in the Box, An Account of the Strange Performances of the Most Mysterious Island in the World," NATIONAL GEOGRAPHIC MAGAZINE, February, 1935.

‡ See "Bear Adventures of North America," by F. W. Nelson. Published by National Geographic Society.

§ See "Riddle of the Aleutians," by Lorrel Wylie Hartman, NATIONAL GEOGRAPHIC MAGAZINE, December, 1943.

Clouds of Ash and Steam Rise Two Miles High from Erupting Okmok Volcano

[illegible]

[illegible] Aleutian Islands [illegible] Alaska [illegible] Bureau of Ethnology [illegible] Bureau of Ethnology [illegible] Bureau of Ethnology [illegible]

Architectures of Volcanic Islands

Other geologists who [illegible] are making important contributions [illegible] Alfred H. Waldron, George C. Kenney, David M. Hopkins, Frank S. Simons, and Bernard Fisher. [illegible] well on the [illegible] of many of the individual volcanoes.

Stimulated by [illegible] structure and history of the entire [illegible] beginning to take shape.

[illegible] it was assumed that the Aleutian Islands, like Hawaiian Islands, are [illegible] simple volcanoes built up entirely from the ocean floor, with only their tops [illegible] above water. Now evidence is growing that most of the Aleutian volcanoes have [illegible] presented [illegible] on a platform of older rocks formed millions of years [illegible], so that the

U. S. Navy Photo

Three-crestered Cerberus Volcano Is Named for the Three-headed Dog That Guarded Hades

From [illegible] the crater [illegible] is about a quarter of a mile in diameter are visible. The third, slightly smaller, [illegible] of the picture to the right. The triplet craters lie within a large crater or caldera 6 miles [illegible] which forms the central part of Semisopochnoi Island. Anvil Peak [illegible] to the background. Last known eruption of Cerberus was in 1875 although [illegible] may have [illegible]

bulk of each present volcano is now above sea level and has been since its formation.

Some of these older rocks were created by volcanic processes, others were laid down as [illegible] and all of them were folded, fractured and [illegible] began to form.

In some islands extinct volcanoes of an older generation overlie this platform of deformed rocks, and in turn are partly buried [illegible] younger deposits of volcanic material.

Probably the relations of land and sea in this part of the world were far different a few million years ago.

It is quite possible that [illegible] long ago, geologically speaking, before the great Ice Age [illegible] land mass of continental type that extended [illegible] is now the Aleutian Trench, a troughlike depression in the sea floor which in places is nearly five miles deep and roughly parallels the Aleutian Arc for a distance of 1,700 miles.

The Aleutian Arc is one of many curving chains of volcanoes that border the shores of the Pacific Ocean. Such volcanic chains are unmistakable symptoms of instability in the earth's crust. How unstable this Pacific region is can well be judged from the earthquakes that frequently shake Japan,* the East Indies, the Aleutians, California, and the west coast of South America.

These earthquakes for the most part are caused by the shifting of blocks of the earth's crust along deep faults, fractures developed in the crust where stresses or strains have built up until they exceeded the breaking point of the rocks. Once a fault is formed, later accumulations of stresses and strains tend to be relieved by repeated movements of the earth's crust along the fault.

Why Are Pacific Areas Unstable?

Why are the borders of the Pacific unstable?

One romantic hypothesis is that the moon once occupied what is now the Pacific basin and was torn loose early in the earth's history by some cataclysm, such as the gravitational attraction of a large celestial body passing near by, leaving the fractured edges of the hole to readjust their equilibrium gradually.

Another theory, not quite so spectacular but more firmly backed by evidence, is that [continental drift. According to this theory, the continental mass of North and South America once was attached to Europe and Africa. It broke loose and "floated" westward—and still is slowly moving westward. This might help explain the unsettled state of the earth's crust, at least along the western edges of the Americas.

Scientists do not agree, however, which of these theories or some other is the real explanation of the instability.

Whatever the nature of the rupturing forces, we know that these great faults or fractures do exist and that they control the location of volcanic chains. The fractures themselves are not easy to find at the surface because they are mostly covered by the outpourings of lava and fragmental material from the volcanoes.

Just what is the earth's "crust"?

Although geologists and geophysicists are not in complete agreement regarding details, it is almost universally agreed that the internal structure of the earth consists of a number of continuous shells. Each grades rather abruptly into its neighboring shells, and each is composed of denser material than the shell outside it. The outermost shell, variously estimated to have an average thickness of 30 to 60 miles, is essentially solid, crystalline rock; this layer is called the crust.

The material of the earth just below the crust is probably of the same chemical composition [illegible] the crust, but is believed to be glassy, rather than crystalline or liquid, because of the combination of the tremendous pressure of the overlying rocks and the great heat at that depth.

The crust is made up of two main kinds of material. The continents and their roots, extending a few miles or tens of miles downward, are composed of rocks which have an average world-wide chemical composition like that of granite. This material is called sial. A thin layer of sial also underlies at least part of the ocean.

Deep beneath the continents, and forming most of the ocean floors and oceanic islands like Hawaii, is denser rock with an average composition like that of basalt—the sima, on which the sial may be regarded as floating.

If pressure is released locally, as in the development of a deep fault extending down from the surface, the heated rocks of the lowermost parts of the crust and the glasslike material of the subcrust may melt, at least in part, and begin to flow toward the fault or other zone of reduced pressure.

Molten Rocks from Earth's Interior

Volcanoes are points at which these molten rocks, called magma, emerge at the surface after rising along tubelike channels in the more open parts of a fault.

The magma may pour out quietly as lava flows or, where locally charged with much gas (mostly water vapor), it may come out explosively, in the form of ash, pumice, or volcanic sand clouds.

Cones form as the erupted material accumulates around the central vent. Sometimes eruption occurs along a fissure and distinct cones do not develop.

Quiet eruptions along a large segment of a fracture may produce immensely broad lava sheets, as in the Columbia Plateau of the northwestern United States and the famed Deccan traps of India.

If fissure eruptions are explosive, they may produce pumice fields covering thousands of square miles, such as those on the North Island of New Zealand or, on a smaller scale, volcanic deserts like the Valley of Ten Thousand Smokes.

Most Aleutian eruptions have been of the central vent type. The volcanoes built in the

* See "Sakurajima, Japan's Greatest Volcanic Eruption," by T. A. Jaggar, National Geographic Magazine, April, 1924.

Frank M. Byers, Jr., U.S.G.S.

Testing Heat of Escaping Steam Is a Case in Point: Geologist Opening Issue a Volcano

On the shore of Umnak Island, geologist Frank M. Byers, Jr., lowers a thermocouple into a fumarole, an opening that emits steam or other gases. The instrument recorded a temperature of 214° F. [illegible] Where [illegible] the heat [illegible] gas [illegible] of molten rock have risen from the earth's [illegible] to increase the temperature inside the [illegible]

[illegible] rates [illegible] are [illegible] cone-shaped strato-volcanoes—that is, layered or stratified volcanoes, built up by alternating quiet flows of lava and explosive showers of ash and pumice. About 80 percent of the material is the product of explosions.

Explosive eruptions are of two main types: ash and pumice eruptions, and "glowing clouds."

In ash-pumice eruptions, magma charged with water vapor and other gases, derived either from accumulation during crystallization of the magma or by downward percolation of water from the surface, is broken into fine fragments and violently ejected in cauliflower-shaped clouds. Fragments of older rock torn from the throat and top of the volcano make up a large part of the solid material ejected in many explosive eruptions.

In major eruptions these clouds may be propelled several miles into the air and their dust spread over vast areas, as gravity and winds take over when the explosive force is spent. Such eruptions sometimes result in the formation of calderas.

An ash eruption comparable to that of Katmai in 1912, if occurring with a 25 mile upwind from the major U. S. military base at Adak, for example, would render the base useless, burying it beneath a heavy suffocating blanket several feet thick; if within 10 miles the loss of life and property probably would be complete.

Even light falls of volcanic ash can do considerable damage, though they may not destroy buildings and equipment or seriously injure people. The ash can enter and clog machinery. Chemicals in the ash may dissolve in the water supply of a settlement so as to disturb or prevent the operation of boilers and

Seen from the Rim of Olympus's Huge Crater or Caldera, the Erupting Cone Belches Ash and Steam Clouds (Not Smoke)

Mass of Hot Lava, Pushing Up Through Snow in Great Sitkin Crater, May Menace a Nearby Navy Fueling Station

[illegible]

even may make the water undrinkable. Such minor ash falls could cripple the engines and armament of planes, trucks, or tanks.

Glowing Clouds Spell Disaster

Glowing clouds, fortunately rare, are perhaps the most spectacular and highly destructive form of eruption. These clouds are a mixture of hot volcanic gas, mostly water vapor, and fragments of hot volcanic rock from which the heated gas is emitted during eruption.

A glowing cloud may froth over the edge of a crater and descend the slope of a volcano merely by the force of gravity; or it may be expelled laterally outward by an explosion from the interior of the volcano. The cloud is generally black, not actually glowing, but is so hot that it will carbonize trees and soften glass.

Glowing clouds have been observed to travel at speeds ranging from 40 to 350 miles per hour, so that a settlement may be destroyed before there is time to escape.

Although millions of tons of fragmental rock may be moved many miles in a few minutes in such eruptions, the clouds travel almost soundlessly, because the gases being given off by the individual cooling rock fragments reduce friction between fragments and with the ground. It was such a cloud that wiped out the population of St. Pierre in the 1902 outburst of Mount Pelée.

The only protection from glowing clouds is distance, or intervening ridges which may stop or divert the progress of the cloud.

Even quiet eruptions—lava flows and volcanic mudflows—can be vastly destructive. Lava sometimes issues from the summit craters of volcanoes, but more often it breaks out through vents on the flanks of the mountain. There is as yet no way of locating in advance the vents from which lava may flow.

Usually the speed of flowing lava is not great, rarely more than a few hundred feet per hour, permitting ample time for those in its path to escape.

For example, when lava from the new volcano, Paricutin, in the State of Michoacán, Mexico, approached the village of Parangaricutiro, its advance was so slow that contents of buildings and even the timbers of which they were constructed could be removed before the arrival of the front of the flow.*

Property caught in the path of a lava flow is completely destroyed, however, and areas covered by recent flows are uninhabitable for many years afterward. Lava in many regions is very fluid and can spread out in thin sheets over large areas, but most flows in the Aleutians have been rather viscous and sluggish; the flows tend to be thick and commonly travel only a few miles from their vents.

Mudflows of volcanic origin are another type of highly destructive eruption. They are caused by eruptions breaking out through lakes, glaciers, or snow fields. The lake waters or melted ice and snow mingle with volcanic ash to form mud, and the mixture runs down the mountainside far faster than lava and with equally disastrous results.

Mudflows in Iceland, resulting from eruptions under glaciers, often carry icebergs of immense size down the mountainsides and deposit them in the valleys below. Mudflows are common in the Aleutians and in the past have wiped out a number of old Aleut settlements, especially on the island of Unimak.

Predicting Eruptions

When a volcano is about to erupt, many physical and chemical changes take place within it. Some of them can be detected at the surface, where they can be recorded and the records studied. Our best hope for predicting eruptions lies in studying these changes.

It is certain that most volcanoes shake, that they swell and contract, and that their internal temperature varies considerably from time to time. These changes, and perhaps others not yet known, may all be related to eruptions, although in complicated ways.

Changes in the earth's magnetism and in its natural electric currents near volcanoes, as well as the temperature and composition of volcanic hot springs and fumaroles (jets of volcanic gas), also may be helpful in predicting eruptions (page 523).

In several observatories to be set up in the Aleutians there will be installed such instruments as seismographs, to measure volcanic earthquakes; tiltmeters, to record ground displacements; magnetometers, to detect changes in earth magnetism; earth-potential recorders, to measure changes in the earth's electrical field; and elaborate temperature-measuring and sampling devices, to study gases and liquids issuing from volcanoes.

Destructive seismic sea waves, or tsunami (commonly but incorrectly called tidal waves, though not related to the tides), often originate from earth displacements in the Aleutian Trench. Seismic sea waves originating in the Trench did severe damage in Hawaii on April 1, 1946; similar waves will surely occur again.

As a by-product of our studies of earthquakes related to volcanoes, we may be able

* See "Paricutin, the Cornfield That Grew a Volcano," by James A. Green, NATIONAL GEOGRAPHIC MAGAZINE, February, 1944.

Sea Waves Battering for Thousands of Years Carved This Cave in an Old Lava Flow

[illegible]

Driftwood from Far Places Provides Fuel and "Furniture" at This Camp Site

[illegible] Alaska Peninsula [illegible] camp in tents and [illegible] Alaskan brown [illegible]

to aid in developing a system for warning Hawaii and other exposed areas that such waves are on the way.

Possibility of harnessing [illegible] power in the Aleutians by [illegible] hot springs or fumaroles, as is widely practiced in Italy and Iceland, or by harnessing the [illegible] heat generated around volcanoes [illegible] be investigated. All fuel now used [illegible] must be imported at great cost and expense.

Although there has been space in this article to name only a few [illegible] who are or have been associated with Aleutian volcano research, special mention should be made of geologist Bernard Fisher who lost his life in line of duty.

On June 22, 1946, he and two soldiers set out in a skiff to examine Ship Rock, a small steep sided island about half a mile off Umnak near Fort Glenn. The sea was as calm as Aleutian waters ever are, and the weather fine. They disappeared behind Ship Rock. Later, their overturned boat was found floating in the Bering Sea.

On Umnak Island a newly discovered caldera [illegible] on the Aleutians [illegible]

[illegible] Aleutian volcanoes [illegible] three streams of lava and [illegible] in lonely isolation.

But today great-circle air routes between North America and the western Pacific [illegible] directly through the Aleutian chain, and the region has assumed outstanding strategic importance. Understanding the behavior of Aleutian volcanoes and the geology of the region in general has become essential to [illegible] planning and conduct of civilian and military activities there.

The United States Geological Survey is well on its way toward such understanding.

Uncle Sam Bends a Twig in Germany

By Frederick Simpich

With Photographs by National Geographic Photographer J. Baylor Roberts

"As the twig is bent, the tree's inclin'd." So Uncle Sam hopes, as his Army in Germany tackles the tough task of training some three million youths for a better way of life.

In Army patter this job is "GYA." That's short for German Youth Activities. Both Ground and Air Forces work at it.

"Hitler might never have gained such power," General Omar N. Bradley, Army Chief of Staff, told me, "and World War II might never have been fought, if German boys had been brought up in our more free, democratic way, instead of being regimented and trained as a mass of embryo soldiers."

In 1933 Hitler outlawed most then existing youth groups; even church work on behalf of youth was hampered. Then came the Reich's Youth Law of 1936. This wiped out all remaining groups and drafted every German boy and girl from 10 to 18 into "Hitler Youth."

The Hitler Way of Training Youth

Thus 12 to 14 million youngsters began compulsory service with premilitary training under 30,000 leaders.

Both sexes took cultural and athletic courses, and flocked to summer camps. Vocational work was closely tied in with the German Labor Front.

Units of Hitler Youth were set up to study [illegible] airplane operation, while others trained for the Navy. Later, hordes of youngsters moved easily from civilian life into the ranks, and the fighting.

Before Germany was whipped, Allied leaders saw that the problem of German youth was to be a big one.

To get the ruined land back on its feet, so it could feed and clothe itself, was civilization's immediate task. And it was the young, in particular, they being more easily reoriented than their Nazi-soaked elders, who were then and still are of first importance.

It is the youth of today, up to 25, says Army, who may soon lead the German nation. If we can train them to lead it along safe paths and make it a sane member in a peaceful family of nations, we may not have to fight it again.

This GYA work involves teaching trades to boys and girls, the better use of leisure time, the problems of waifs, tramps, and juvenile delinquency, new moral and political concepts—many things.

To this task our Army brings its full facilities, in support of our Military Government, or "MG" in Germany.

Scope of USA Program

To date, Army has aided more than 500,000 boys and girls. Working for GYA are thousands of volunteer men and women, including Army officers, enlisted men, Army women, WAC, Red Cross staffs, American and Allied civilian employees of Military Government, Air Force, and our Department of the Army—and a host of Germans (pages 540, 543).

At first our soldiers made use of gum, candy, soft drinks, baseball gear, jeep rides—and just plain, good-natured American horseplay—and a few new-learned German phrases.* But they were only curtain raisers. We've settled down, now, to hard, earnest work to change German youth's thinking habits and set it new goals in life.

MG controls radio stations in Bremen, Frankfurt, Stuttgart, Munich, and Berlin's RIAS; they give first-hand facts about work conditions. If our President or a British Prime Minister makes a speech about ways the Allies seek to restore Germany, that's discussed, without political twists.

MG makes its own broadcasts, to correct false rumors. Or such talks may range from Germany's need for exports and imports to school problems, public health, civil service, and food.

At 28 different Information Centers MG runs libraries full of American newspapers, magazines, books and maps, shows industrial and educational films, gives lectures, and arranges for debates and discussions and "Town Meeting of the Air," attended also by thousands of adult Germans.

MG officials lead many of these round tables, whose themes may range from farm life in California to how a German boy trained in a GYA trade school can now find a job.

More than a million youngsters have already seen such MG-sponsored films as *Union Pacific*, *San Francisco*, *The Story of the Lincoln Tunnel*, and *The Adventures of Mark Twain* (page 547).

* See "What I S a Across the Rhine," by J. Frank Dobie, National Geographic Magazine, January, 1947.

Propaganda-filled Nazi Schoolbooks Are Replaced Now by Honest Ones Approved by AMG

[illegible]

[illegible] American [illegible] *Three Men on a Horse* [illegible]

Forums and Debates Encouraged

One of GYA's [illegible]

[illegible]

[illegible]

[illegible] later "and study at Black Mountain college in North Carolina [illegible]

Another good debater was a boy, Dieter [illegible] youth group.

Boy Scouts March to Camp on the Banks of the Historic Neckar; Heidelberg in Background

German Scouts have never been [illegible] GYA [illegible] not [illegible] in the [illegible]

"We sell about 3,000 [illegible] a month," he said, "and could sell a lot more if we could get paper."

"So could I, out in Weissensee," agreed [illegible].

It was a fine party, showing GYA spirit [illegible].

When you see with what hearty purpose German youth shares in these GYA meetings, you feel the power history has given Uncle Sam over the destiny of these millions.

Mass Thinking Hard to Combat

The Heil, the goose step, and Nazi nonsense about Germans being the "master race" are gone; but the old, inborn habit of mass thinking [illegible] survival of military indoctrination [illegible] hard to eradicate.

My [illegible] years ago, when we lived in Berlin after World War I, [illegible] had [illegible] in the [illegible] and regiments of [illegible] instead of playing baseball or [illegible] or wrestling [illegible] some [illegible] [illegible] [illegible]

For generations the worship of force, militarism, [illegible] and power has been [illegible] German children [illegible] through their music, history, and folklore.

[illegible] what General Bradley has in mind when he says Army's hard job now [illegible] German youth to think more of the [illegible] of individual and not [illegible] of how to earn a living [illegible] and help rebuild their [illegible] country industrially, not just how to [illegible] soldiers.

What makes [illegible] the fact that Germany [illegible] such as British and American [illegible] democracy.

It [illegible] had [illegible] at July [illegible] [illegible] resentment against [illegible] nationwide Town Meeting of the Air in Lin[illegible]

The Berlin "Corridor" Begins at Frankfurt

Rothenburg, Exquisite Example of a Medieval City, Is a Favorite with GI Sight-seers

[illegible]

[illegible] debates, no traditions of Pilgrim Fathers, Puritans or Quakers.

In plain Yankee slang, they've had too much *Heil the Kaiser* or *Heil Hitler*, and not enough hurrah for Hoover, Roosevelt, Truman, or Dewey, or hurrah for any other candidate who can take defeat at the polls with a smile and then buckle down to help his victorious opponent run the nation's affairs.

After [illegible] years of Army's hard GYA [illegible] Germans still [illegible] Nazis.

Others who now try to help in our youth-training programs say that if we should pull out, Russia will come in, and every German who has worked with the Americans will be hot.

But over and [illegible] in addressing schools, girls' and boys' clubs or in talking with [illegible] Germans, when I [illegible] Do you want the Americans to [illegible] there arose a loud almost [illegible] No.

Air Force's Work with German Youth

"How many of you can speak some English?" I [illegible] at a country school near Königsberg. Of the 34 pupils, 24 held up their hands.

Just then an American Air Force mobile library truck drove up, and all the [illegible] who had borrowed books on the truck's previous delivery ran out with them to exchange for others.

Air Force, commanded by Lt. Gen. Curtis E. LeMay, runs six such book trucks and up to the day photographer [illegible] Roberts [illegible] I were in Wiesbaden [illegible] headquarters. I had

[illegible] "Time Forgot" in [illegible] Magazine [illegible]

A New Generation Facing a New Life, Turns Its Back on the Wreckage of War

War was on when millions of such German [illegible] were infants. In early youth, to them, war was the normal way of life. They [illegible] Now here at Frankfurt a group of American Military [illegible] work with German kindergarten [illegible] young girls and boys. An American girl, Lydia [illegible] of Greensboro, North Carolina [illegible] a sewing class, and an Army captain runs a trade school.

lent out some 35,000 books and lost only [illegible] (Page 341.)

[illegible] Christmas, Air Force entertained [illegible] young [illegible] GYA sponsors ten newspapers [illegible] printed by young Germans, and more than 50 youth centers flourish at airbases in the U. S. Zone and at Berlin. It builds playgrounds [illegible] movable auto gardens, sets up summer camps [illegible] and then it helps youth to take over and run for a day the duties of an Air Force base, in the democratic way.

Wives of Air Force officers and men, by writing letters to the States, receive hundreds of boxes of shoes and clothing for German children. These American women, working with their husbands' aid organizations, welfare agencies, parents' advisory councils, and parent-teacher associations by instilling in both German parents and youth a larger sense of civic responsibility.

[illegible] only a chocolate bars; and no attempt is made to ram democracy down German throats. Instead Air Force works on a well-rounded program of educational, cultural, and avocational activities.

"Operation Boys Town"

One outstanding job is "Boys Town," near Munich. This was set up by the Oberpfaffenhofen Airport, which lent tents, field kitchens, cots, and bedding. Then the airport renovated a 3-story villa, once a Nazi home, and put the boys in it.

Each new boy is given shoes, a dyed and made-over suit and [illegible] to get sprayed with DDT and [illegible] leftover food from the airport, supplemented by 1,000 calories a day from German relief agencies.

Now Boys Town, aided by Air Force GYA, elects its own assembly and lives under a self-imposed government. Boys are taught athletic games, trades, and English.

This Stuttgart Street Scene Is Reenacted in Every City from Essen to Munich

[illegible]

[illegible] salaries [illegible] In [illegible] playing "marbles" [illegible]

[illegible] of work [illegible]

[illegible] Military Police. I [illegible] with these [illegible] They [illegible]

Many of [illegible] from the [illegible] Zone [illegible] parents [illegible] or brothers. But [illegible] Under wise leadership they [illegible] themselves.

[illegible] the most hopeful reports of [illegible] anywhere. [illegible] with words that burn holes in the paper.

For adherence to GYA [illegible] the Germans [illegible] food and clothes than [illegible]

Says one Army GYA [illegible] Germans expect more than Americans can give. They [illegible] a pattern of unlimited abundance of American sundries, and [illegible] they do not get everything [illegible]

In one youth center youngsters were willing to accept the benefits of GYA, but unwilling to work in the youth center.

Some adult [illegible] who are powerful as leaders in certain youth groups display jealousy of GYA's growing popularity, [illegible]

Caste [illegible] Some [illegible]

Fourth of July Motorcycle Races Held Thousands of Gls and Germans in the Garmisch Foothills of the Bavarian Alps

[illegible]

A Bavarian Maid Miller on a Summer Day Rakes a Meadow Sweet with Her [illegible] Home of the Passion Play

Boys' Fingers Are Taught to Knit Discarded Material into Items of Clothing

[illegible] in Eger [illegible] near Munich [illegible] parachutes. Note the GYA [illegible] "Who Knows Soon They Will Run the Show"

the same roof with members of working [illegible] youth groups, and even rival religious or political groups [illegible]

One of GYA's chief aims is to save German youth from becoming the dupe of political [illegible]

Some [illegible] of GYA [illegible] Allies should first work to rebuild Germany [illegible] Nazis into good citizens.

[illegible] not without some justification, says Fred M. Hechinger, writing in the [illegible] to talk democracy [illegible] if we want for German schools [illegible] the German people [illegible] right will have [illegible] Allied government will have been party, by default, to [illegible]

GYA [illegible] against the Red tide

Besides Army and Air Force, much work of a GYA nature is done by other groups. Cultural materials have come from the Smithsonian Institution, American Library Association, the Association for Childhood Education, the States of North Carolina and Connecticut, colleges, and other institutions.

One particularly useful task is done by the American Friends Service Committee, the [illegible] group with which Herbert Hoover [illegible] to feed and clothe so many children after World War I.

For its fiscal year 1947-1948, this committee spent two million dollars.

It employs about 50 American and British representatives in Germany and gets additional help from German individuals and welfare groups. Seven neighborhood centers are maintained, through which direct relief work is done, including, in some places, laundries and libraries. The Friends set-up at Freiburg University is operated entirely for the benefit of students.

"Max," Cushioned and Comfortable, Rides Regally in New Version of Bicycle Built for Two

[illegible]

[illegible] weeks. McCloy [illegible] the first quarter of [illegible] fill minimum needed [illegible] Zone [illegible] Zone [illegible] United States [illegible] National Assembly [illegible] Zone.

Under McCloy [illegible] the East new world [illegible] to the U. S. Zone [illegible] It [illegible] but what we want to know [illegible] girls told me [illegible] what the German [illegible] look like when the Russians in our East [illegible] Allies in our West finally agree on our new frontiers.

Nazi Textbooks Destroyed

[illegible]

Sgt. Pat Moriarty Inspects a Water Wheel Built by Garmisch Boys

[illegible]

[illegible]

[illegible]

[illegible]

GYA Works Through Youth Groups

[illegible]

[illegible]

"Have You Got a Good Book on How They Make Movies in Hollywood?"

[illegible] cut them out (page [illegible])

[illegible] before Hitler [illegible]

YMCA's and YWCA's are [illegible] Among [illegible] who have helped [illegible] John R. Mott, Nobel prize winner [illegible] long a leader in world-wide YMCA work.

Youth clubs are strong and potentially [illegible]tive. MG rules permit [illegible] groups to [illegible] dominated by political parties but not [illegible] Instruction [illegible] democracy is [illegible] democratic [illegible] Germans leaders, free from [illegible] political [illegible]

Several [illegible] are [illegible] of Nazis [illegible] political [illegible]

In the French Zone [illegible] Zone [illegible] it is to form groups and clubs [illegible] trained leaders, free from Nazi taint [illegible]

In their Zone the British have a school for training leaders. In our Zone the YMCA, YWCA and trade unions [illegible] but [illegible]

The Military Government [illegible] to fight [illegible]

[illegible] progress [illegible] Sunday in Württemberg-Baden [illegible] soccer games were played [illegible] American colored [illegible] children [illegible]

[illegible] Mohan [illegible] participation [illegible]

This Young Boy Is Learning to Make Cheese

[illegible]

An Observant and Wondering Student Monitores a Woman Lady

[illegible]

Pigtails and Feet Fly as Bouncing Girls Elude Their Jumping Rope

[illegible]

[illegible] GYA [illegible] camera [illegible] 37 other [illegible]

GYA [illegible] American [illegible] Youth Helps Youth Plan.

[illegible] letters from members of [illegible] 4-H Club [illegible] Zone [illegible] Youth Helps Youth Plan.

[illegible] Zone. Leaders from the [illegible] (page 558).

[illegible] Hall [illegible] American [illegible] Germans [illegible] will be welcome.

[illegible] Hall [illegible] to American [illegible] Germany [illegible] German [illegible] generations.

The [illegible] "Youth Helps Youth" [illegible] American Houses [illegible] world.

[illegible] about American ways [illegible] These Youth-to-Youth letters [illegible] German and American [illegible]

[illegible] Germany [illegible] of

Not an Emperor, or a Baron on a Boar Hunt—but a Rigs Driver!

[illegible] and that alarming brown and green hat, drew many wonderings from GIs [illegible] around Garmisch. For years a winter [illegible] of American soldiers. They ride its horse-drawn hacks, hold [illegible] "international relations." But if [illegible] a transfer, [illegible] for the States will [illegible] within 30 days.

[illegible] There's a sad shortage of [illegible] Too many were confirmed [illegible] are not allowed now by Mil. to resume teaching. He wishes teachers might be sent over from America and feels that a wider exchange of college students between Germany and the United States would [illegible] for better international understanding and be a barrier against the spread of [illegible] Nazism.

German mothers, I found, are grateful to both British and American women who have helped obtain medicines, clothing, and other needed things from England and the States.

I talked with [illegible] wives of several [illegible] active in this work. One wrote to American [illegible] for needed medicines [illegible] One friend sent $4,000 worth of vitamins. Another American woman wrote for baby talcum powder and received a shipment [illegible] British counterpart [illegible] rations.

I'm a former [illegible] of the University of Minnesota [illegible] Women's Club, said one American woman. I wrote to old friends in it, and now get about three boxes a week of thread, needles, buttons, [illegible] toothbrushes [illegible] In one child clinic I found only 10 combs in use among 350 patients.

The writer himself [illegible] how scant [illegible] are. He [illegible] his pants asked the German housekeeper at Frankfurt [illegible] to sew it [illegible] he had to [illegible] an Army PX [illegible] both [illegible] keeper had none.

In both the British and American Zones Army women [illegible] money by putting on sh[illegible] dinner parties, etc.

One group in Munich put on a cake sale, cut the cake into four parts and sold it at auction. Then the buyer would pay [illegible] and sell it again, till that one cake brought [illegible]

[illegible] the Army women, WAC [illegible] civilian employees [illegible] sacks from the post bakery and make underwear for German children.

[illegible]

Elizabeth Brown, Boston born, started Heidelberg GYA girls' center a year ago with a membership of 35. Now she has 1,188 girls enrolled.

Though most GYA workers despair of changing the thinking habits of German adults or former Nazis, more than 400 German mothers visited this center in one month, took tea, and watched their daughters at work and play. Some of the teenagers in groups are students at Heidelberg University.

I heard choral groups sing "Swanee River" and "My Old Kentucky Home." I heard some of these girls sing at American church services. These maidens make blouses, suits, skirts and dresses from old uniforms, blankets, parachutes, and other materials collected by GYA from our armed forces.

Besides dress making, pattern cutting, and sewing, there are classes in music, English, photography.

Many of the Wacs work in spare hours with these girls. To talk English with the American women is a source of entertainment and joy to our girls, said Mrs. Brown. "It brings them new ways of self-expression and confidence.

While we try, at these centers, to be democratic without specifically mentioning it, when we talks with older girls we do embrace the chance to tell about the form of government in the States . . . and how we feel about what kind of government might be best for the Germany of tomorrow, which they must inherit.

MG aims at no "the right control." It wants Germans to think for themselves, to draw on their own rich, historic cultural resources to getting re-educated, yet conform to "certain universally valid principles of justice," such as toleration, respect for human dignity, and the free exchange of right ideas among all men and nations.

Some 200 German students have already been sent to the States. Their expenses are paid by private sponsors, by universities and religious bodies.

Counting His Chickens *After* They're Hatched

[illegible] of Frankfurt [illegible] will help [illegible] Frank Nelson who served three years in prison [illegible]

Education For Our Own Soldiers in Germany

German youth learns another useful lesson from seeing how well Uncle Sam treats and trains his own soldiers. General [illegible] told me of his keen personal interest [illegible]

Girl Workers from Frankfort Factories Enjoy a Summer Camp in the Taunus Mountains

[illegible]

[illegible]

[illegible]

What a Study in Facial Expressions as Youth Is Gripped by a Mickey Mouse Movie!

[illegible]

[illegible]

[illegible]

Schools for American Children

More than 12,000 American Army and [illegible] in the Zone [illegible]

"Frau" [illegible] Club in Munich to Send Me These Fine American Farm Pictures"

[illegible] Nazi Hitler Youth [illegible] A [illegible] German children start correspondence with youngsters [illegible] in America [illegible] sent down overseas by our Air Force now [illegible] Helped by American soldiers on duty at Munich [illegible]

Our soldiers like this German tour of duty. Besides good pay and allowances [illegible] to play with plays, sports, movies [illegible] but if [illegible] 21 [illegible] have already [illegible] but for the Stars in 30 days!

[illegible] easy trips to historical spots in [illegible] where old Romans used to romp. [illegible] trips to [illegible]

[illegible] our shooting lures hundreds. [illegible] daughter of one American officer [illegible] went out, bareheaded, and shot a [illegible]

I wish more Americans would kill more [illegible] hungry wild pigs," complained one German farmer. "Your Army won't let us [illegible] have guns; yet pigs ruin my crops. [illegible] 30 or 40 trotted down from the [illegible] rooting up my potatoes. All night long four of us threw rocks and sticks [illegible] potato field from [illegible]

German Youth Wonders Signs of Recovery

[illegible] Go West, young man!" They have [illegible] Oregon, or Montana; unlike their [illegible] ancestors, they no longer have colonial [illegible] vast lands of opportunity such as Canada, Australia, New Zealand, South Africa. They have to stick it out in Germany, the grim ghosts of hate their elders wrought.

So youth intently watches our work—and that of the French and British—to rebuild Western Germany. They [illegible] can be stabilized politically [illegible] can impart more food.

Many told me they [illegible] must make [illegible] must quit making expl[illegible]

[illegible] Asks, "What Breed of Dog?" The Question Stumps Young Heidelberg

[illegible] Magazine [illegible]

[illegible] stand the Allied reparations policy? [illegible] and [illegible] take apart and break up [illegible] other [illegible]

[illegible] American Industry [illegible] "Why [illegible]" [illegible]

In the [illegible]

Now [illegible] packages [illegible] Germany [illegible] interesting [illegible]

The European-American [illegible] Recovery Program [illegible] closely studied. When [illegible] highest since the war, young Germany knows that means [illegible]

ECA helps bring in raw cotton and [illegible] for more shoes, and [illegible] fertilizer [illegible] seeds as well as [illegible] foods.

[illegible]

canal barge transport, all aimed at the Zone's more rapid business recovery, are involved in Military Government's task and affect the progress of GYA work. In all this, through bizonal action, the British and Americans work closely together.

British Occupy Industrial Area

The British occupy the Ruhr, center of coal mines and heavy industries. They hold Germany's business district. Uncle Sam gets the scenery, with the yodelers and accordion players of Bavaria.

But the British were among the first to bring food and start re-educating youth.

At Darmstadt's Institute of Technology we met British engineering students from Cambridge, there to study German.

Dr. Richard Vieweg, then the head of this excellent seat of learning, showed us about. He lectures to shivering, hungry young men in bombed-out classrooms, all rooms are without doors or windows, and many have big holes in their roofs.

Vieweg's students must work so many hours a day, with shovels and wheelbarrows, to clear away rubble. They have few books or scientific instruments, almost no paper, and scant food that's poor and tasteless. But they plod grimly on.

We rode day after day through the American, French, and British Zones. Save Heidelberg, every big city we saw from Essen to Cologne, Koblenz, Mainz, Frankfurt, Wurzburg, Nurnberg, and so on south is in ruins.

It may take from 30 to 50 years to rebuild them; some may never be rebuilt, because the need for them has passed.

In some cities, broken brick and stone and twisted steel are being hauled out into the country on specially laid tramways; in many others, no effort at all has been made to clear away ruins. Dead people still lie beneath fallen walls, with wooden crosses stuck here and there bearing names of those who lived in that particular house.

This is the new "dark continent" in which bewildered youth faces its uncertain future.

Ride out of any blasted city's apocalyptic ruins into serene country-sides where smug farm folk, untouched by war, own a few fat geese, a cow or two, gardens and fruit trees, and everybody looks better fed (page 537). But farmers keep their few pigs locked, hidden, so nobody may see how many!

You meet hungry townspeople riding out into the country on bicycles, looking for food. Farmers bring produce to town, but would rather trade than sell—everybody would rather have things than cash.

A piece of pork will pay for dry goods, or a pail of butter buy some hardware the farmer needs, quicker than money will. At some villages you see bulletin boards with swap and barter offers posted.

Our Zone is a miniature America. Army's gas stations, road patrols, grim-faced menacing military police, speed limits, parking rules, and constabulary, and its PX stores full of Yankee corner-drugstore goods, its ball games, movies, Army family life, and schools for American children give our occupation here an air of permanence despite its setting in this picturesque medieval land of southern Germany. It's just as if whole scenes from American life had been gipsy over here.

Yet, to us, this is alien soil. Boys from Kansas seem out of place among the Bavarians. Kansans don't wear green Alpine hats stuck with a sawing brass, green knee pants, or velvet vests and rucksacks, and they don't paint landscape scenes on their barns, or yodel to their cows, or play accordions and sing folk songs in beer halls.

But in such towns as Garmisch you may see American soldiers from Kansas, or any other state, with all the self-confidence of early Roman conquerors, riding about in carriages and holding fraulein's hands, learning the German language, and spreading the gospel of private enterprise, individualism, and the streamlined American way.

Our soldiers like this country. Many want to re-enlist and stay longer.

All our top-hole fighting men in Germany heartily back up GYA work. "Tangible results are great," I was assured by Lt. Gen. C. R. Huebner, Deputy Commander in Chief, European Command. "The whole GYA job shows the initiative, generosity, and loyalty to American ideals which are the outstanding characteristics of the American soldier and of those who work with him at this important task.

"There are sergeants who have started boys clubs at their own expense; Wacs who give steadily of their time to aid and teach German girls; and there are civilian men and women working just as officers and soldiers do. The contributions of my staff, which made it possible for every German schoolchild in Frankfurt to have a really worth-while Christmas [illegible]

[illegible] Military Governor of Germany) is a brown-eyed Georgian with a will of steel. His Berlin task is tough. He told me so! But he takes time out, even in the midst of crises, to encourage GYA workers.

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In addition to the editorial and photographic surveys constantly going on, the Society has sponsored more than 100 scientific expeditions, some of which required years of field work to achieve their objectives.

The Society's notable expeditions have pushed back the historic frontiers of the southwestern United States to a period nearly eight centuries before Columbus crossed the Atlantic. By dating the ruins of the vast communal dwellings in that region, the Society's researches solved secrets that had puzzled historians for three hundred years.

In Mexico, The Society and the Smithsonian Institution, January 16, 1939, discovered the oldest work of man in the Americas for which we have a date. This slab of stone is engraved in Mayan characters with a date which means November 4, 291 B. C. (Spinden Correlation). It antedates by 300 years anything heretofore dated in America, and reveals a great center of early American culture previously unknown.

On November 11, 1937, in a flight sponsored jointly by the National Geographic Society and the U. S. Army Air Corps, the world's large[illegible] balloon, Explorer II, ascended to the world altitude record of 72,395 feet. Capt. Albert W. Stevens and Capt. Orvil A. Anderson took off in the gondola hanging under a gas-filled aluminum balloon, and obtained results of extraordinary value.

The National Geographic Society-U. S. Army Air [illegible] was the seventh expedition of The Society to observe a total eclipse of the sun.

The Society cooperated with Dr. William Beebe in deep-sea explorations off Bermuda, during which a world record depth of 3,028 feet was attained.

The Society granted $[illegible] and in addition $15,000 was given by individual members to the Government when the congressional appropriation for the purpose was insufficient, and the trees of the giant sequoia forest in the Giant Forest of Sequoia National Park in California were thereby saved for the American people.

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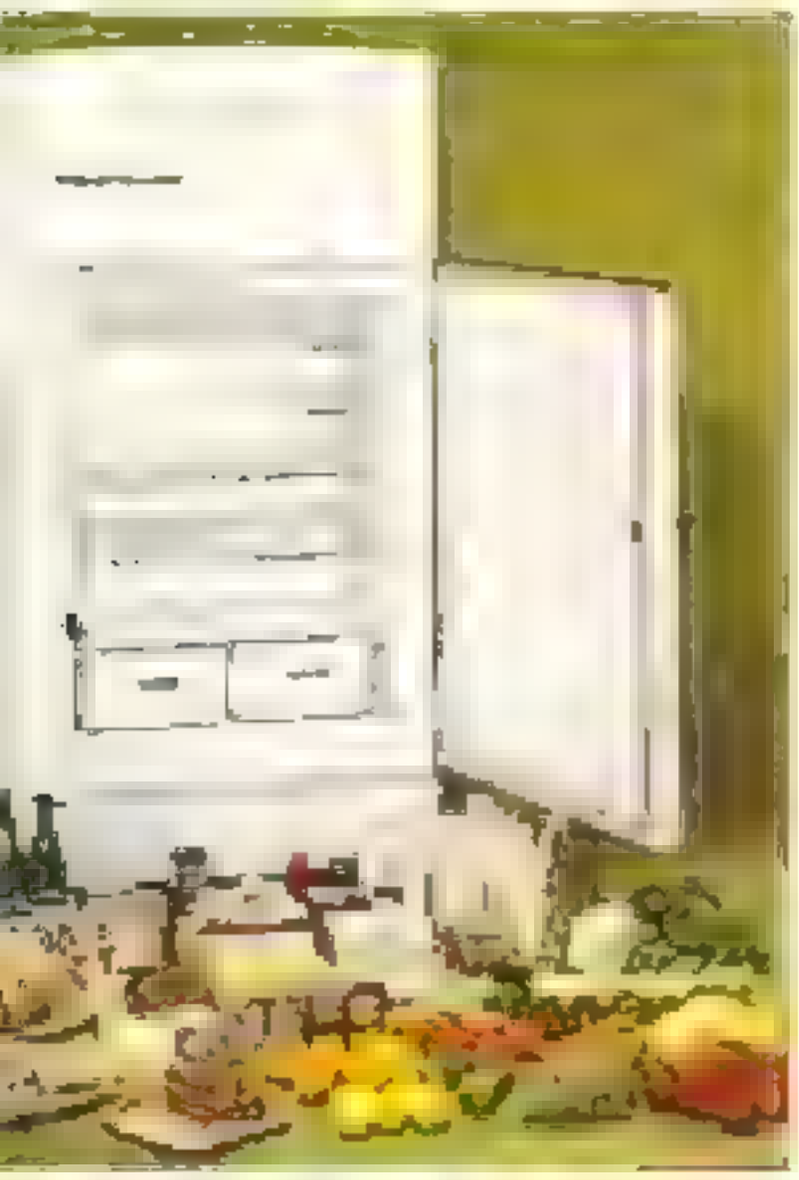

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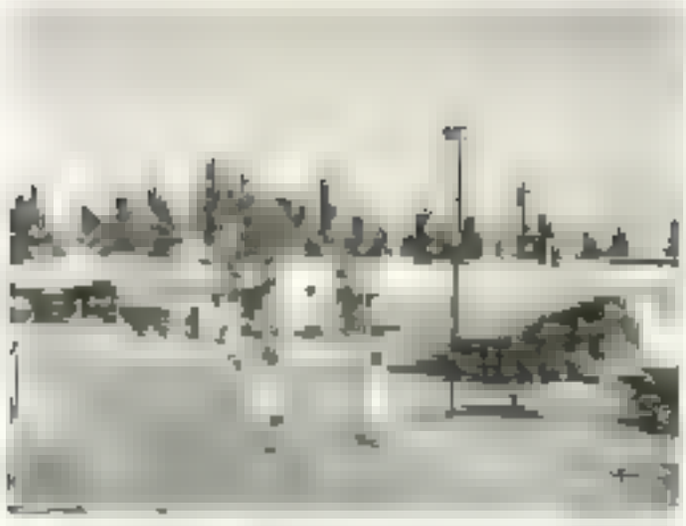

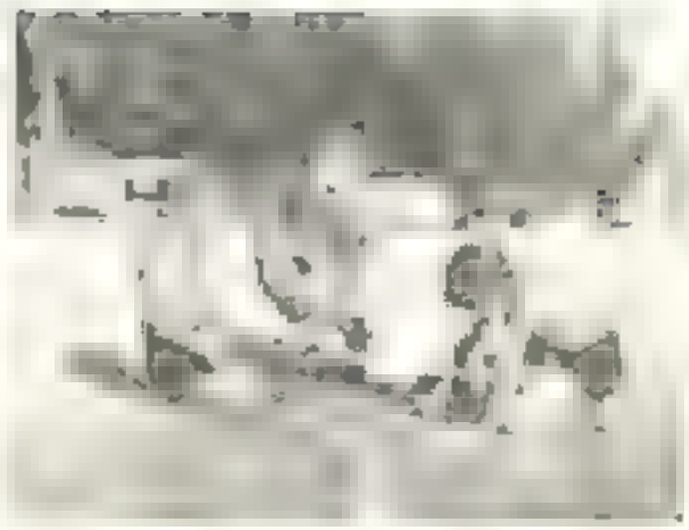

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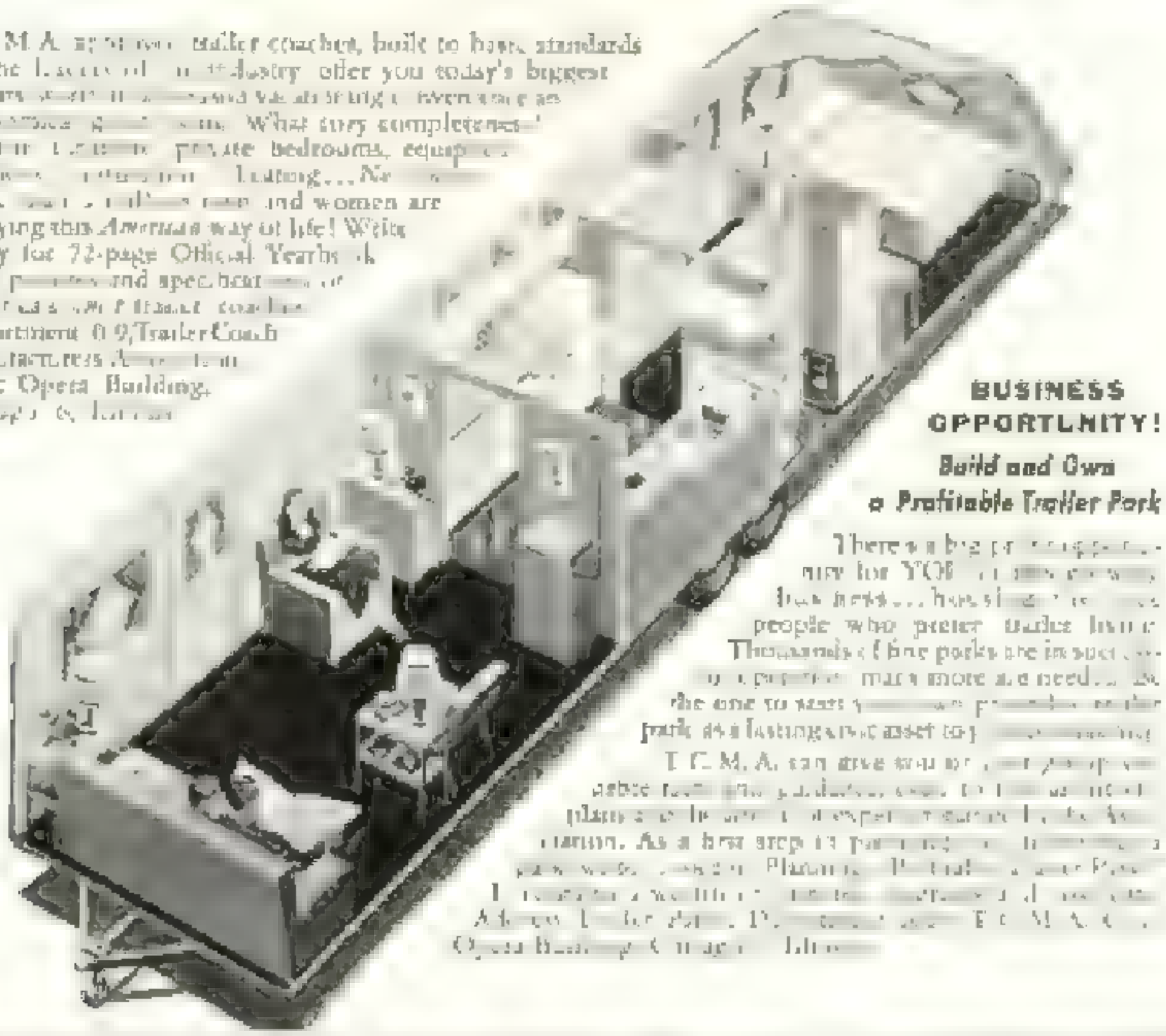

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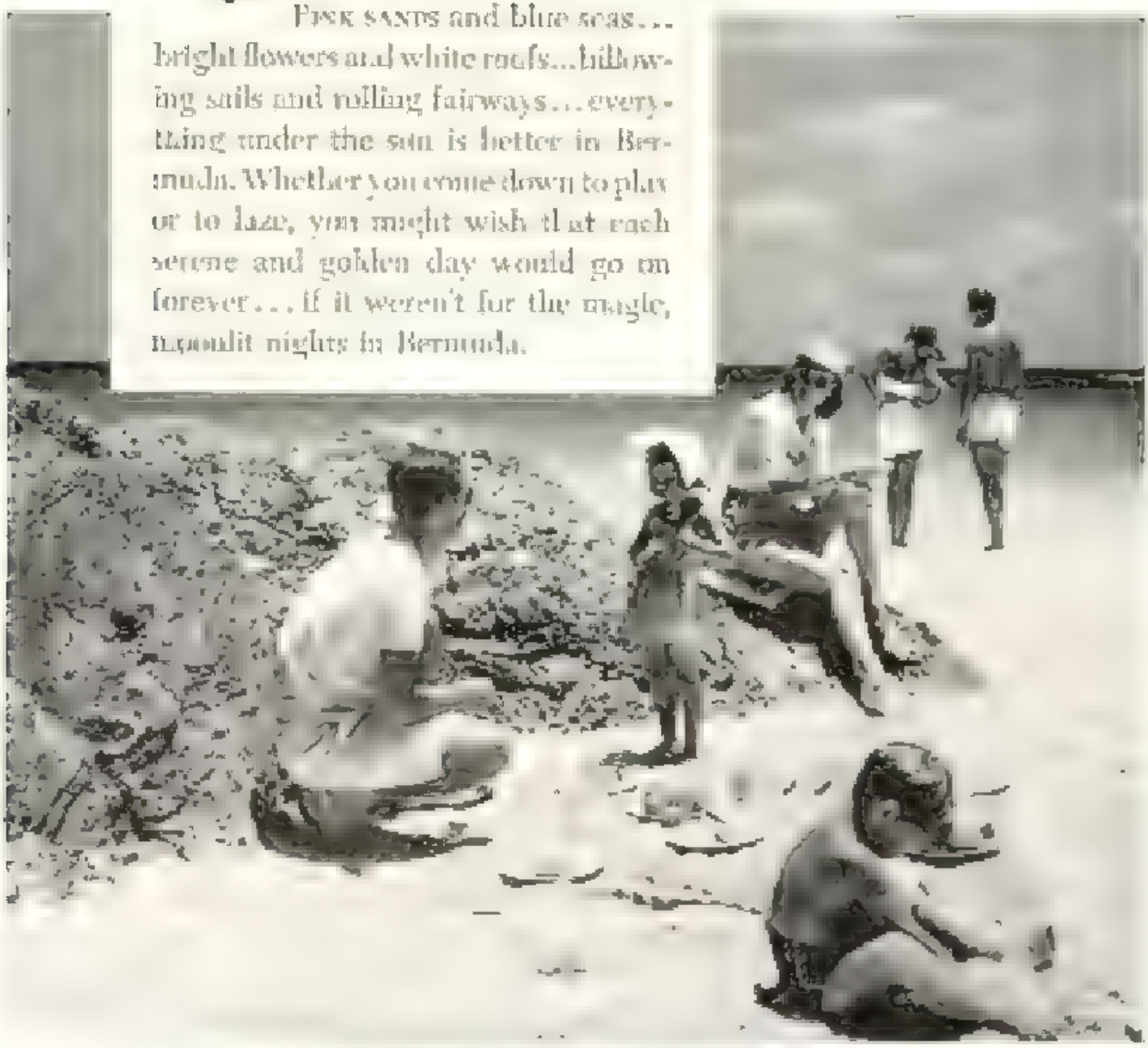

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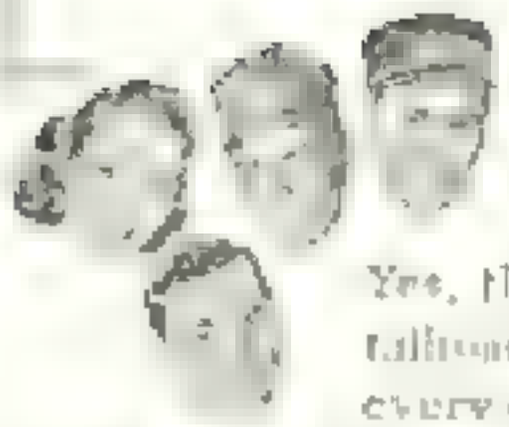

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Behind the engineers and stenographers, the purchasing agents and ticket agents, the track walkers and car men . . . everybody who works on the railroads . . . is an investment of more than 2½ billion dollars.

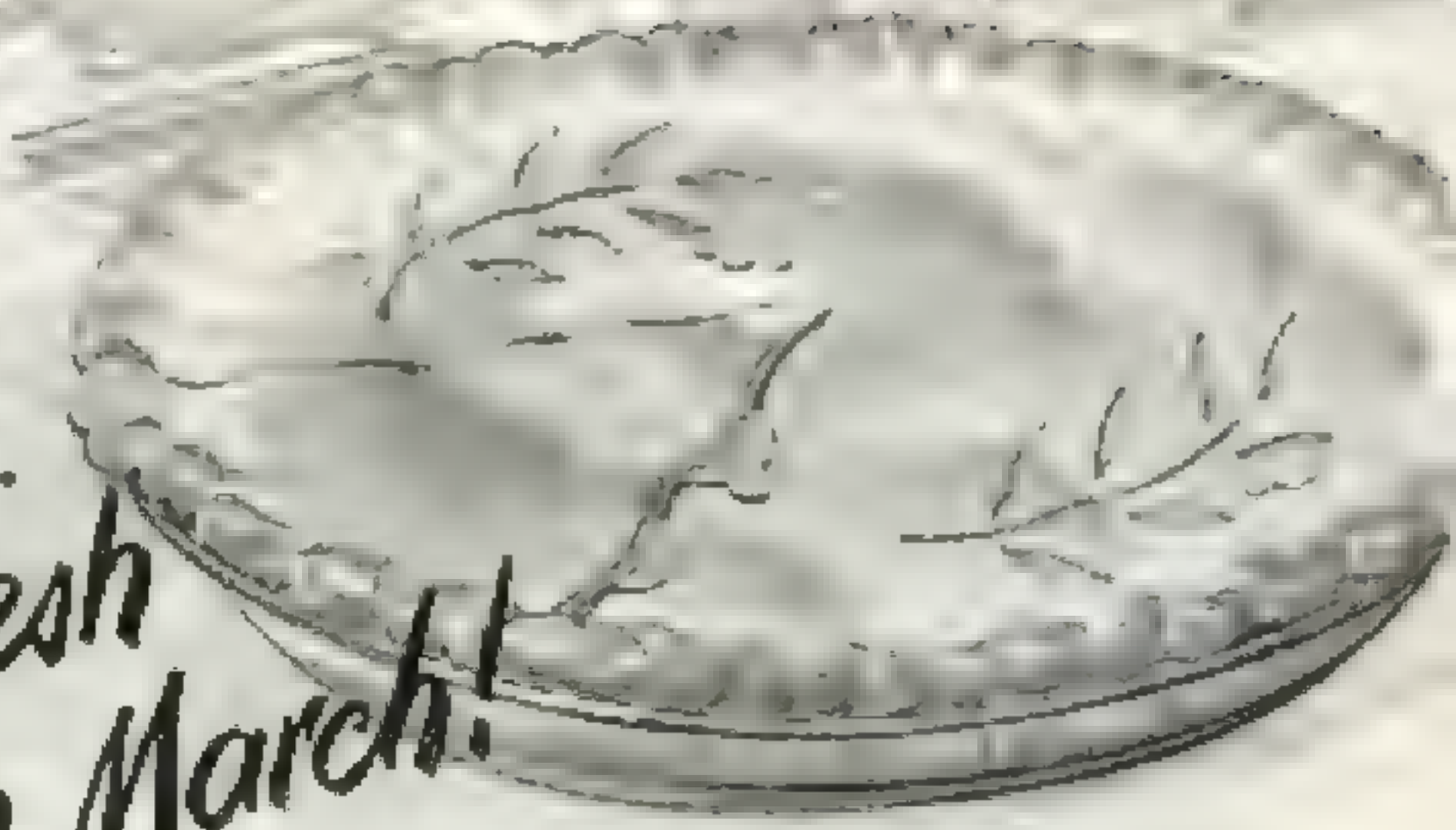
These dollars . . . about $20,265 for each employee . . . have provided the tracks, the cars and engines, the repair shops and all the other "tools" which make it possible for American railroad workers to move the greatest volume of traffic the world has ever known . . . with maximum safety, efficiency and economy . . . and to earn the world's highest railroad wages.

Railroads are being continually improved. More powerful locomotives, freight cars of increased capacity, luxurious streamlined passenger trains, heavier rail, reduction of curves and grades, new signals that increase safety and efficiency—all are being added as fast as materials become available.

To continue to improve America's greatest mass transportation system, the railroads should be allowed to earn enough to supply their workers with even more productive tools. Only in this way—combining the resources created by the pooled and invested savings of millions of persons with the skill of railroad men and management . . . will the railroads be able to keep on furnishing the lowest transportation that is essential to the life of the nation.

ASSOCIATION OF AMERICAN RAILROADS

WASHINGTON, D. C.



Apple Pie, fresh-baked in October . . .

Still fresh in March!

[illegible] Philco freezer. [illegible] Philco freezer will [illegible] the course of home [illegible] your [illegible] and [illegible] everywhere. It's [illegible] to your [illegible] keeping foods at zero [illegible] months and keeping them *fresher* [illegible] vitamin rich. Get [illegible] from your Philco dealer.

Says Mrs. Clara Tradeau of Atlanta, Georgia

[illegible]

Keep Foods FREEZER-FRESH™

"FRESH AS THE DAY THEY WERE PICKED, CAUGHT OR BOUGHT"

PHILCO MODEL AY-73 Deluxe Cabinet, [illegible] cu. ft. capacity [illegible] lbs. of frozen foods. 3 compartments, one [illegible] freezing. Patented sliding shelves and 2 position door doors conserve cold. Temperatures as low as 15° below zero. Built-in Thermometer, Outer Door Lock and Temperature Control. Battery-operated Guard'ian Bell. Hermetically Sealed Power-System. Philco quality throughout.

PHILCO FREEZER

Famous for Quality the World Over

• *General Electric Automatic Dishwasher saves hours of kitchen drudgery! Washes dishes sparkling clean. They dry in their own heat!*

1. A day's dishes done the magic [illegible]

2. No more rough, red hands! [illegible]

3. Gives you new hours of freedom! [illegible]

4. No dishes to wipe — ever again! [illegible]

• • •

NOTE: [illegible]

AUTOMATIC DISHWASHER

DOES THE DISHES BY ITSELF

GENERAL ELECTRIC

Let them be the Judges!

There's a lot of difference
in low-priced cars and

PLYMOUTH

makes the difference!

The "spell" of the South

It's in the perfect blending of the charm and achievement of the Old with the excitement and promise of the New...

It's in the rising hum of busy factories ...the warm smiles of friendly hard-working people...the gentle climate ...the bountiful resources of Nature... the expanding markets...

It's in the breath-taking "image" of new industries springing up almost overnight... all along the 8,000-mile Southern Railway System...

It's in the certainty, here in the South, that the historic Past and the dynamic Present are but stepping stones to an even brighter, more prosperous Future.

"Look Ahead—Look South!"

Ernest E. Norris

President

LOOK AHEAD LOOK SOUTH

SOUTHERN RAILWAY SYSTEM

The Southern Serves the South

Machines in RCA's Lancaster Tube Plant [illegible] part of Radio Corporation of America's television picture tube [illegible]

Behind the magic of a Television Tube

[illegible] "bottles" go down to the production lines at the RCA Tube Plant in Lancaster, Pa.

[illegible] are television [illegible]

[illegible]

[illegible] Forming a screen on which are [illegible]

[illegible] is so delicately handled [illegible] though RCA's [illegible] are working with fragile glass, breakage is less than 1%.

Water, twice-distilled, finds the [illegible] material into place on [illegible] tube, where it [illegible]

[illegible]

Every phase of manufacture conforms to [illegible] specified by RCA Laboratories [illegible] Television tubes of highest performance—assuring clear, clear pictures on the screens of RCA Victor home television receivers.

When in Radio City, New York, be sure to visit [illegible] RCA Exposition of Advance, RCA Building, Rockefeller Center, New York City.

RADIO CORPORATION of AMERICA

Why is going Pullman like...

...a visit with friends?

1. [illegible]

...a night out?

2. [illegible]

...a night at home?

3. [illegible]

...a lock on your door?

4. [illegible]

...a happy ending?

5. [illegible]

Go Pullman

THE SAFEST, MOST COMFORTABLE WAY TO GET THERE!

The National Guard Defends America—Join Now

Admiral Triple thrill!

TWO-SPEED PHONOGRAPH | MAGIC MIRROR TELEVISION | FM-AM RADIO

Complete Home Entertainment all in One

FM-AM Radio and Automatic Phonograph

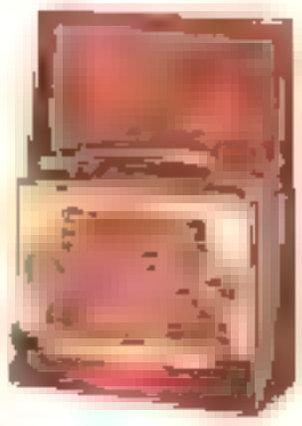
[illegible]

$99.95

3-Way Portable

[illegible]

$34.95

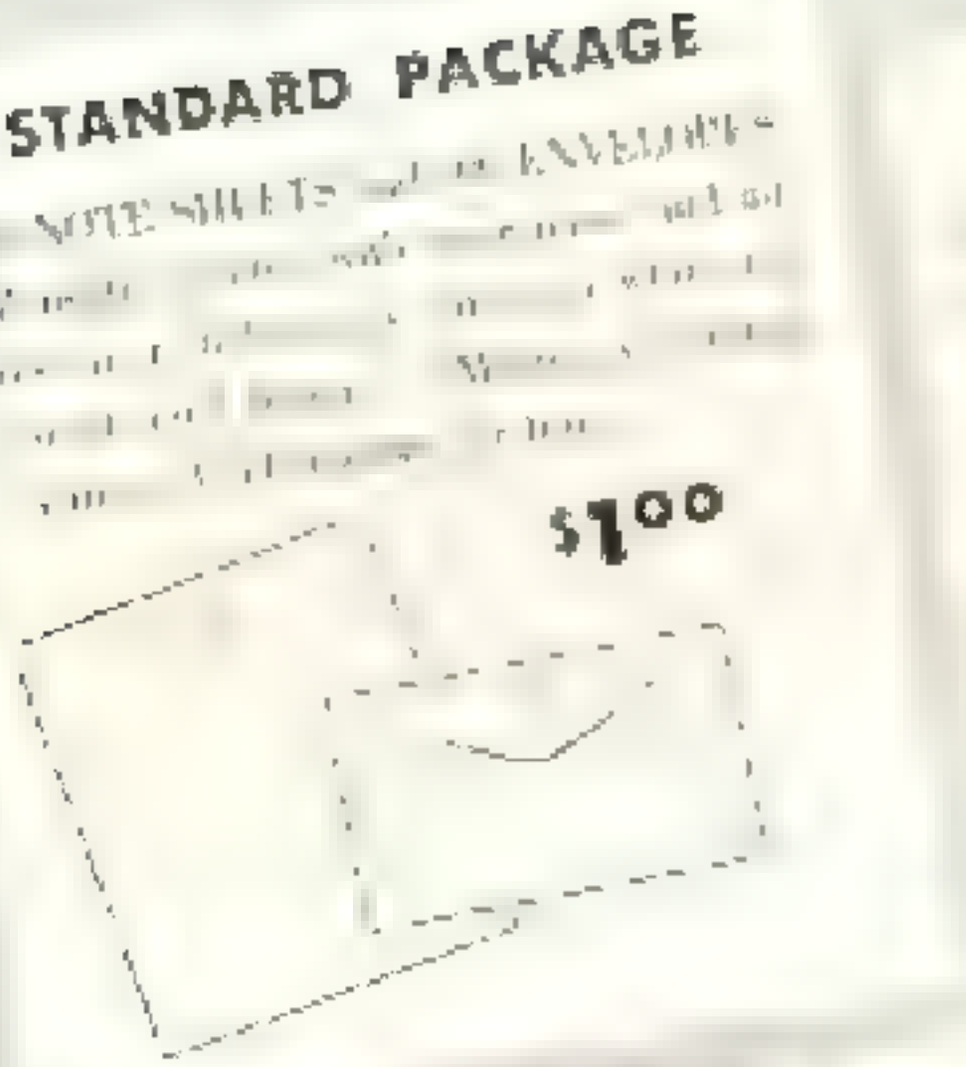


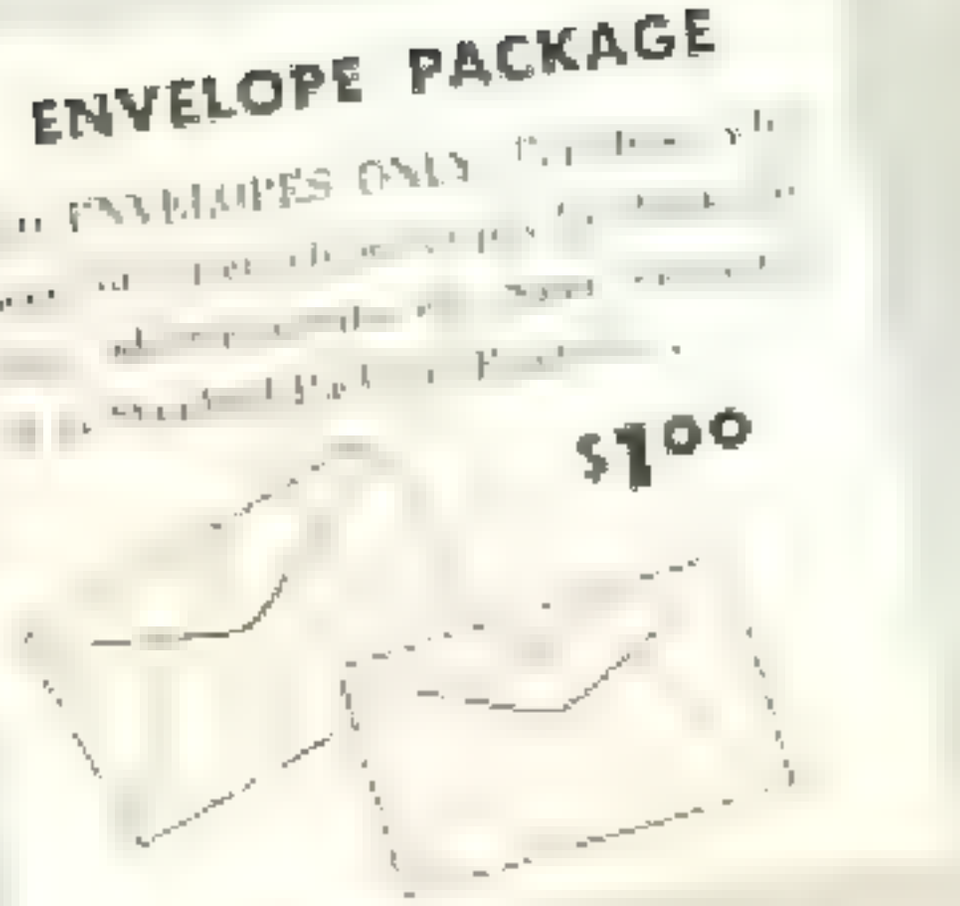
Luxurious Console

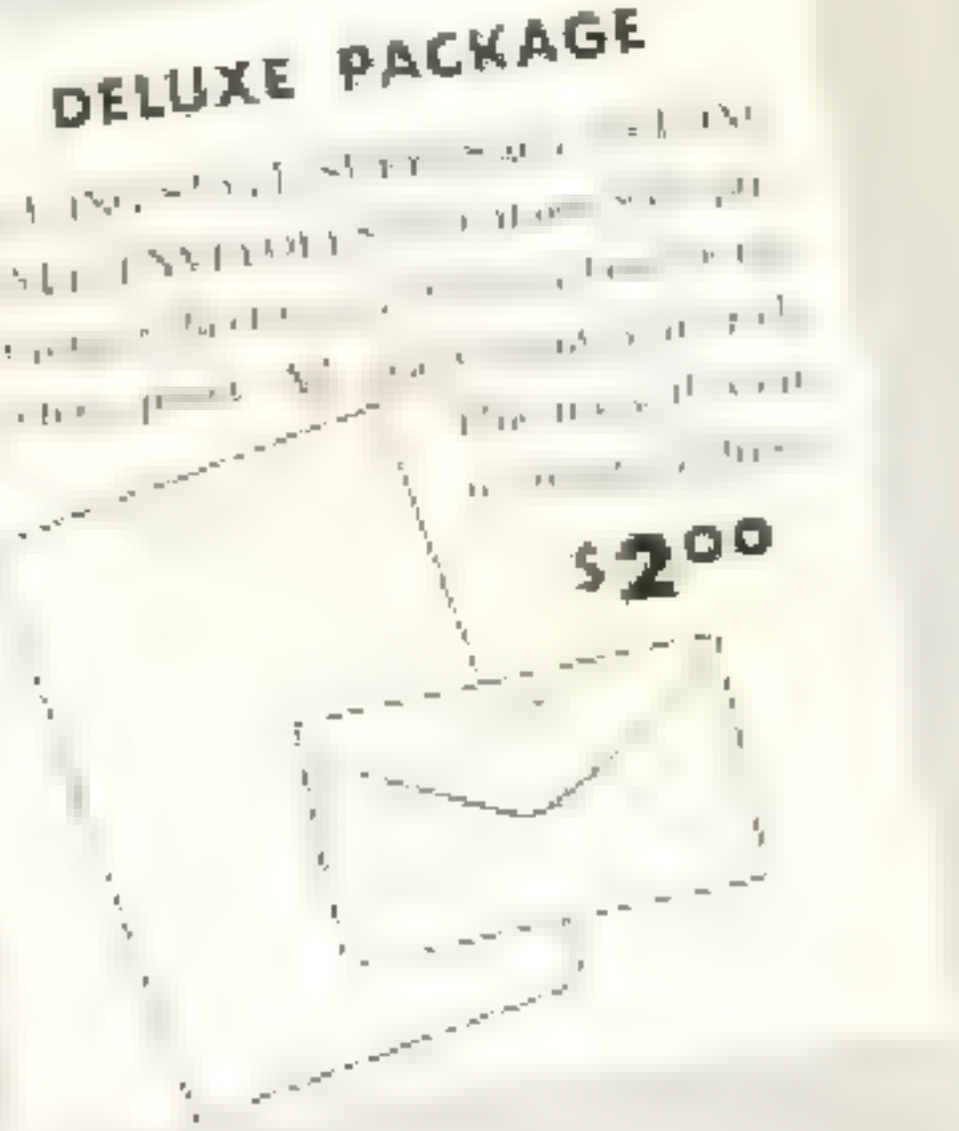
$499.95 [illegible]

[illegible]

From Admiral comes complete home entertainment to charm your family and guests. Magic Mirror Television brings you bright, steady motion-like pictures on a big 10" direct view screen . . . the clearest pictures of them all! Super-powered by 25 tubes to assure dependable performance even in fringe areas. Reserve one at Admiral's. New two-speed automatic phonograph plays standard as well as new LP (long play) 45 r.p.m. microgroove records. Here, too, is a powerful radio with the finest features in FM-AM as developed by Admiral. Truly a triple thrill . . . all combined in a great luxury [illegible] beautiful cabinet that measures only 48 inches wide! See it! Hear it! Today







AMERICAN STATIONERY

The Fine Stationery in the Plain Box

ORDER NOW FOR *Christmas*

[illegible]

[illegible]

THE AMERICAN STATIONERY COMPANY, 300 PARK AVENUE, PERU, INDIANA

"Energy and persistence conquer all things." — BENJAMIN FRANKLIN

Why power now serves us better

[illegible]

[illegible]

[illegible]

In pursuit of happiness
Revere adds to your pleasure

Y[illegible]

[illegible] Revere [illegible] all reasonably priced. Revere [illegible] Company, Chicago 17

Revere
EIGHTS and SIXTEENS

REVERE "B3" 8mm PROJECTOR

[illegible]

$120.00

REVERE "88" 8mm CAMERA

[illegible] $77.50

[illegible] $110.00

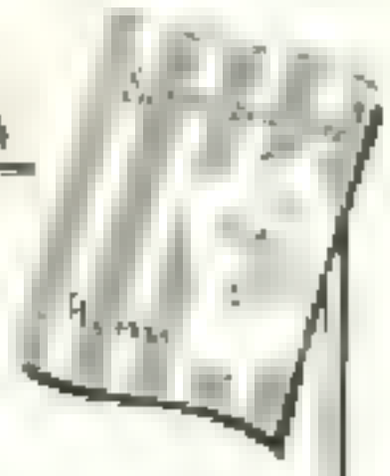
[illegible] and it will our extensive bedroom and dining room displays. We arrange of purchases through authorized Rway dealers. Rway offers style and value far in excess of price.

NORTHERN FURNITURE COMPANY

Showrooms in the following cities

BOSTON • CHICAGO • CINCINNATI • CLEVELAND
DALLAS • DETROIT • KANSAS CITY • MILWAUKEE
MINNEAPOLIS • NEW YORK • PHILADELPHIA
PITTSBURGH • ST. LOUIS • SYRACUSE • SHEBOYGAN

"The Food Is Marvelous!"



Baltimore's Finest Hotel is renowned for tempting Maryland dishes!

Sheraton Belvedere

Arlington Hotel

[illegible]

W. A. CHESTER, General Manager

"Brilliant styling is only half the glory!"

said **ROSALIND RUSSELL**

when she learned of the

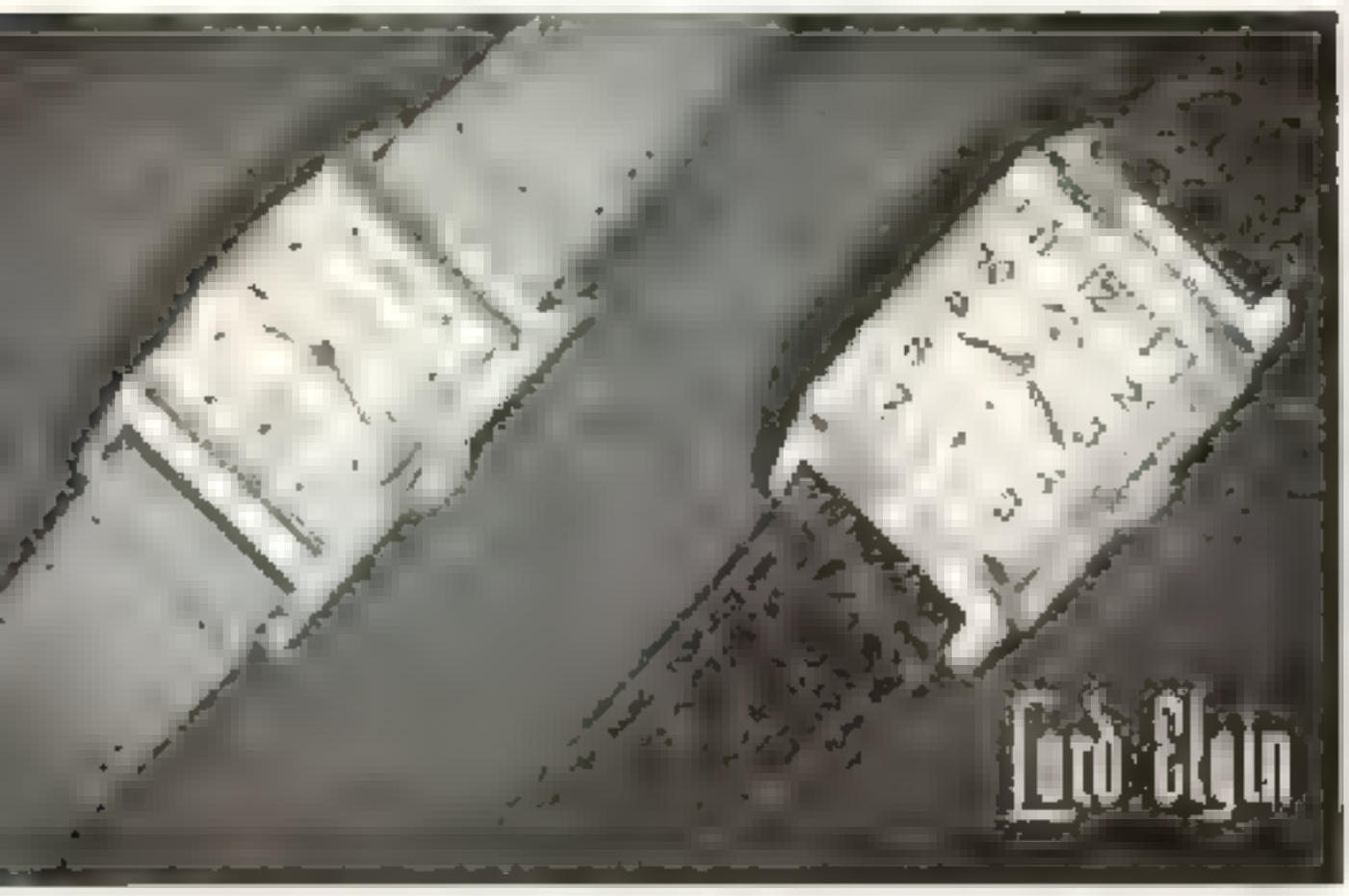
new DuraPower Mainspring in

ELGIN *Watches*

ELGIN watches

TIMED TO THE STARS!

The genius of America ★ ★ to wear on your wrist



Lord and Lady Elgin are priced from $67.50 to $5000. Elgin De Luxe from $4[illegible] to $[illegible]. Other Elgin watches as low as $29.75. All prices include Federal Tax.

*Marks of Elgin Watch Parent Company

Most important accessory in a woman's attire is a smartly styled watch, and the new Elgin Watches are acclaimed in best-dressed circles all over America.

Yet, as Miss Russell said, "brilliant styling is only half their glory." Beneath their beauty is a truly remarkable advancement in timekeeping—Elgin's miracle DuraPower Mainspring.

Here for the first time is a mainspring that will never rust, and rust is the greatest cause of breakage. A mainspring that *holds* its "springiness" for a *permanency* of timekeeping performance never before possible. Here, at no extra cost, is a mainspring that eliminates [illegible] watch repairs due to steel mainspring failures.

Surely you'll want the very smartest styling in the watch you give a loved one. And you'll want this newest achievement of America's creative and productive genius. Only in an Elgin Watch can you get both. Look for the DuraPower symbol "dp" on the dial.

You can be sure... if it's

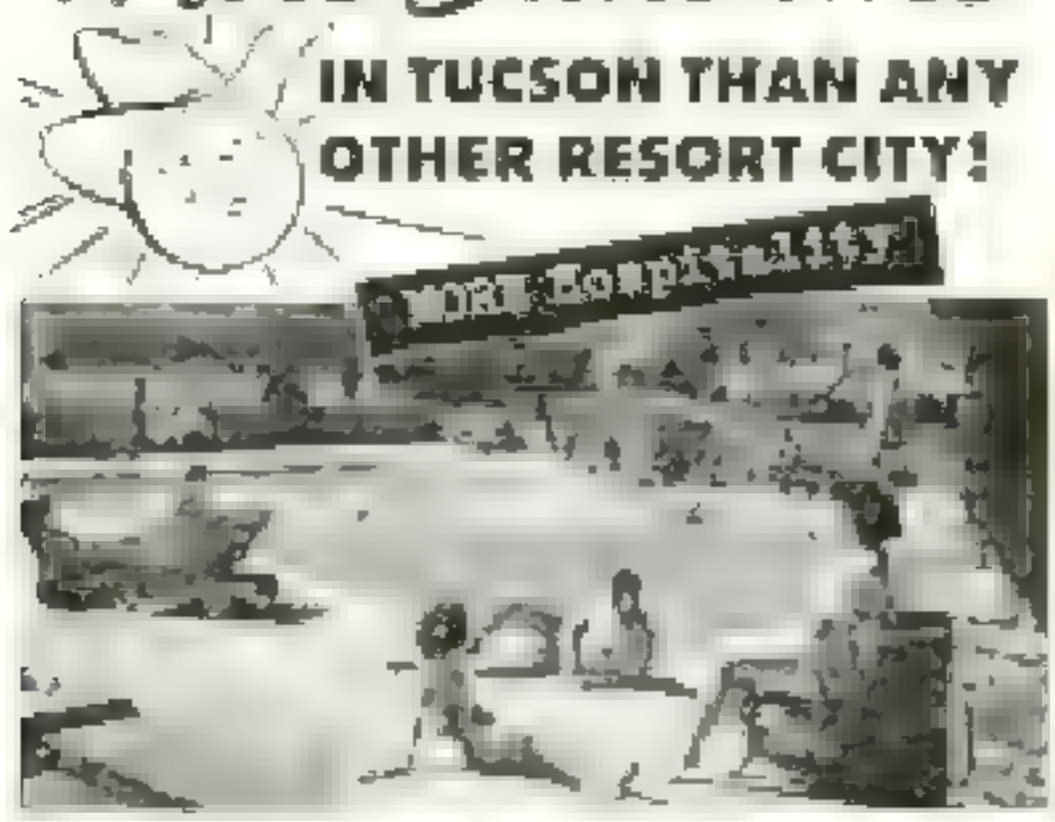
Westinghouse

All radio-phonographs may look pretty much alike to you . . . but there can be a big difference in the listening. You will get far more enjoyment out of a set that's built *up* to a standard than you will from one that's built *down* to a price. And you don't have to be an expert to tell the difference. You can be *sure* if it's Westinghouse.

Listen... and you'll buy **Westinghouse**

Listen to Ted Malone every morning Monday through Friday ABC Network

More Sunshine



IN TUCSON THAN ANY OTHER RESORT CITY!

Mild winter days are ideal for outdoor sports. Tucson's warm sunshine weather is perfect for swimming, golfing, riding, hiking, tennis, tennis, tennis at Land of Arizona. It's the place to be for a great fun vacation. Visit Tucson, Visit San Xavier Mission, Old Mexico, nearby Rio Rico, Desert Museum, Tucson Mountain Park, Sabino Canyon, Saguaro National Monument. New luxurious hotels and modern motels. Modern dude ranches. Famed Indian Reservations. Nationally known golf courses. Tennis, Tennis, Tennis!

THIS WINTER YOUR PLACE IN THE SUN IS

Tucson

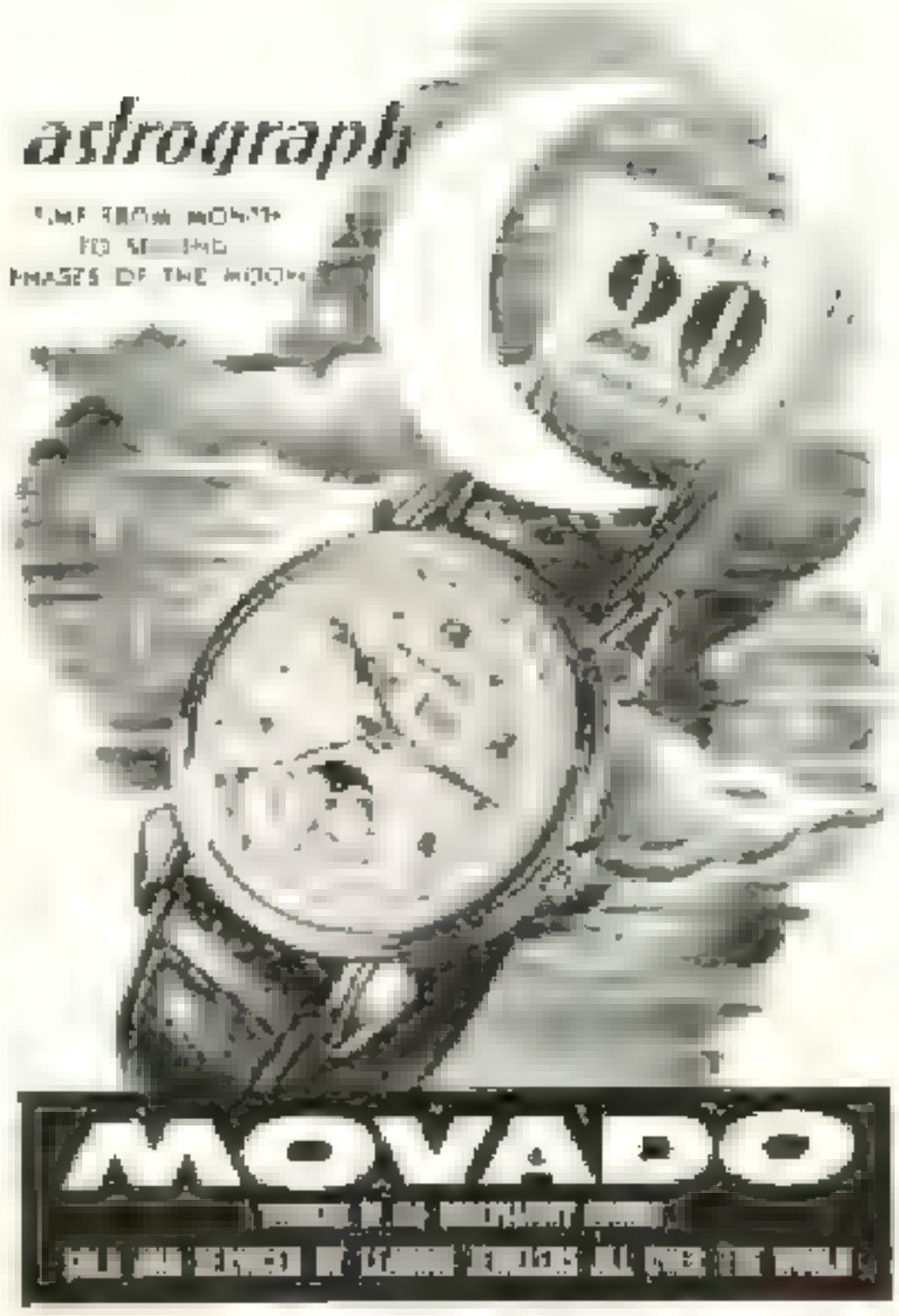
IN FRIENDLY ARIZONA

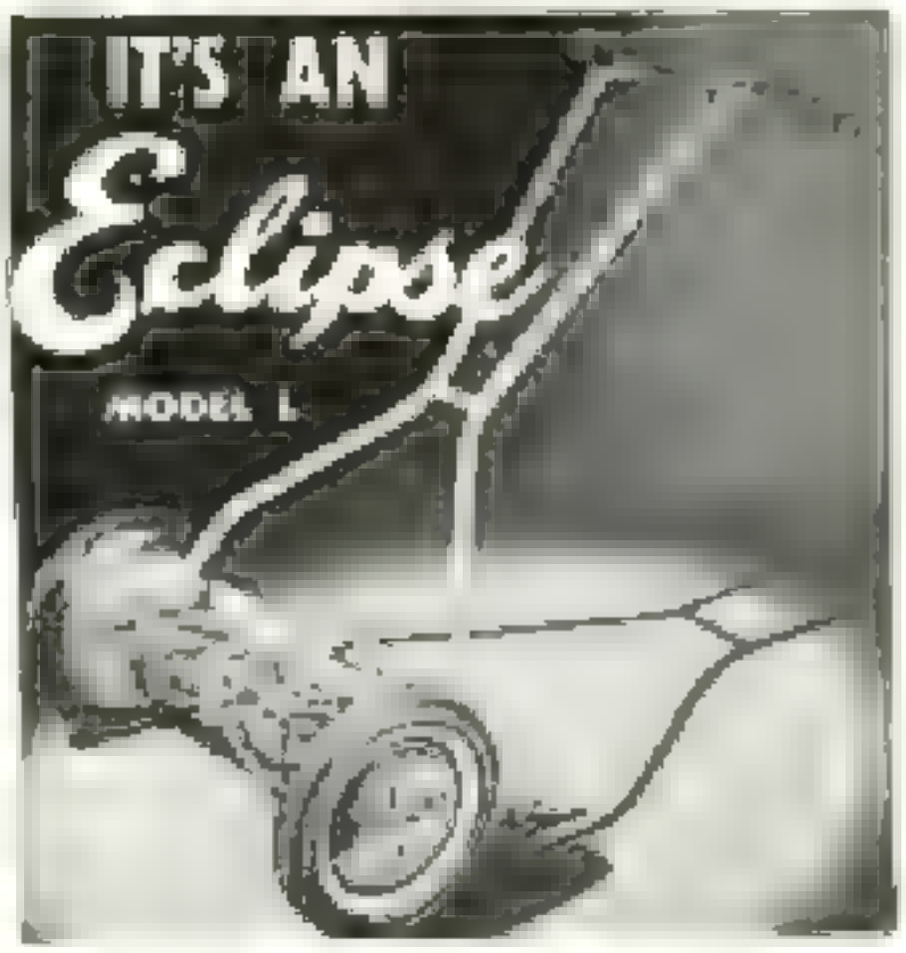
SEND FOR FREE ILLUSTRATED BOOK NOW!

Name

Address

City





THE WORLD'S BEST LAWN MOWER

Smooth mowing action. Free-rolling handling ease and [illegible] Eclipse [illegible] power [illegible] Eclipse [illegible] features that make Eclipse [illegible] Eclipse [illegible] Eclipse [illegible]

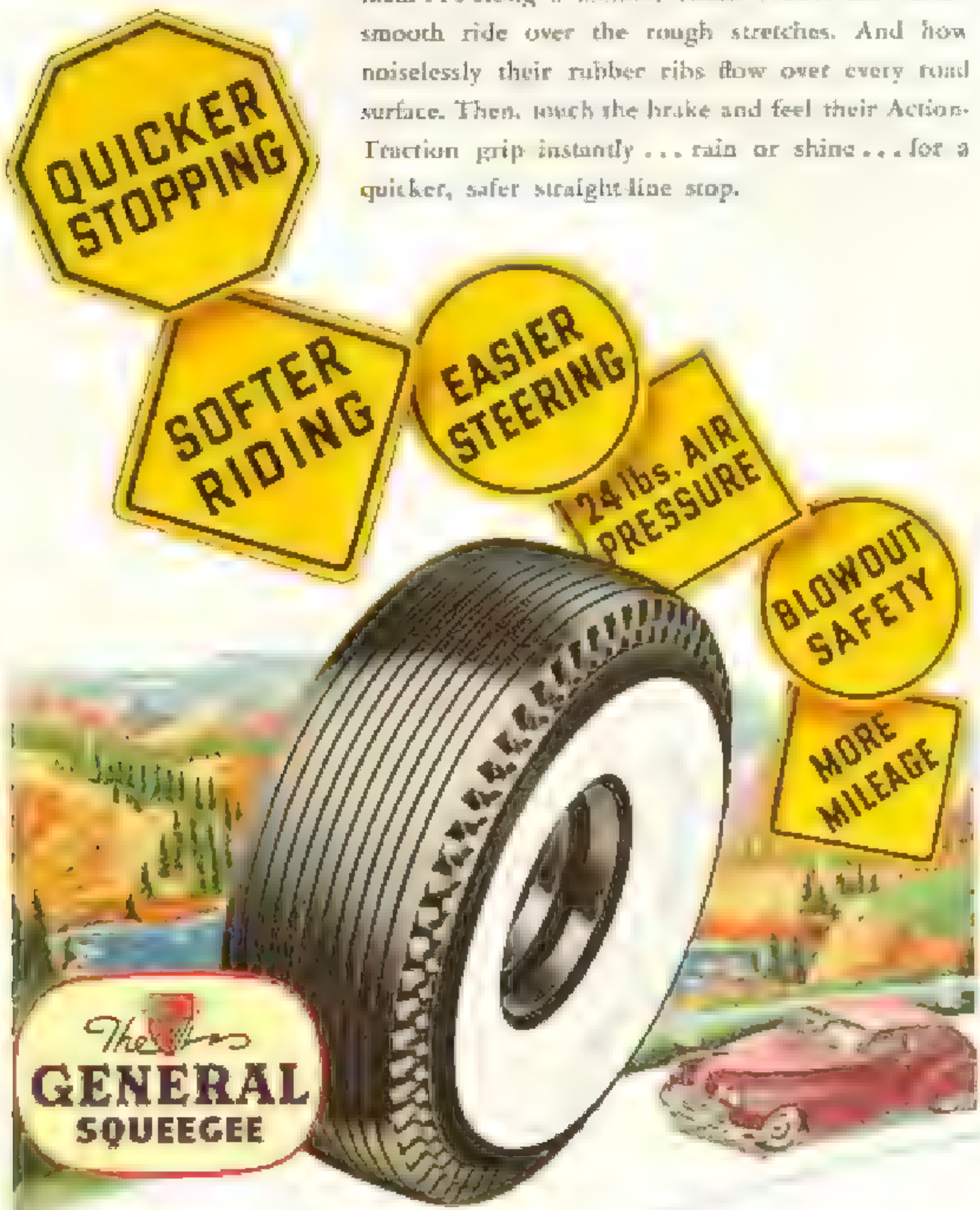
THE ECLIPSE LAWN MOWER CO.

Rockford, Illinois

HAND AND POWER MODELS

SURE SIGNS OF *Safety*...

THE GENERAL SQUEEGEE CUSHION . . . for 24 lbs. of air . . . improves the road you travel. Try them . . . along a familiar route. Notice the velvet-smooth ride over the rough stretches. And how noiselessly their rubber ribs flow over every road surface. Then, touch the brake and feel their Action-Traction grip instantly . . . rain or shine . . . for a quicker, safer straight-line stop.



— goes a long way to make friends

WHEN YOU'RE FACED WITH DRIVING PROBLEMS...

Check over the different kinds of trips you take in a year —*vacationing, shopping in the city, week-ending with friends, commuting, traveling for business, or just sight-seeing*—and you'll find that they offer a lot more travel ease, more peace of mind, if made in a Greyhound Super Coach.

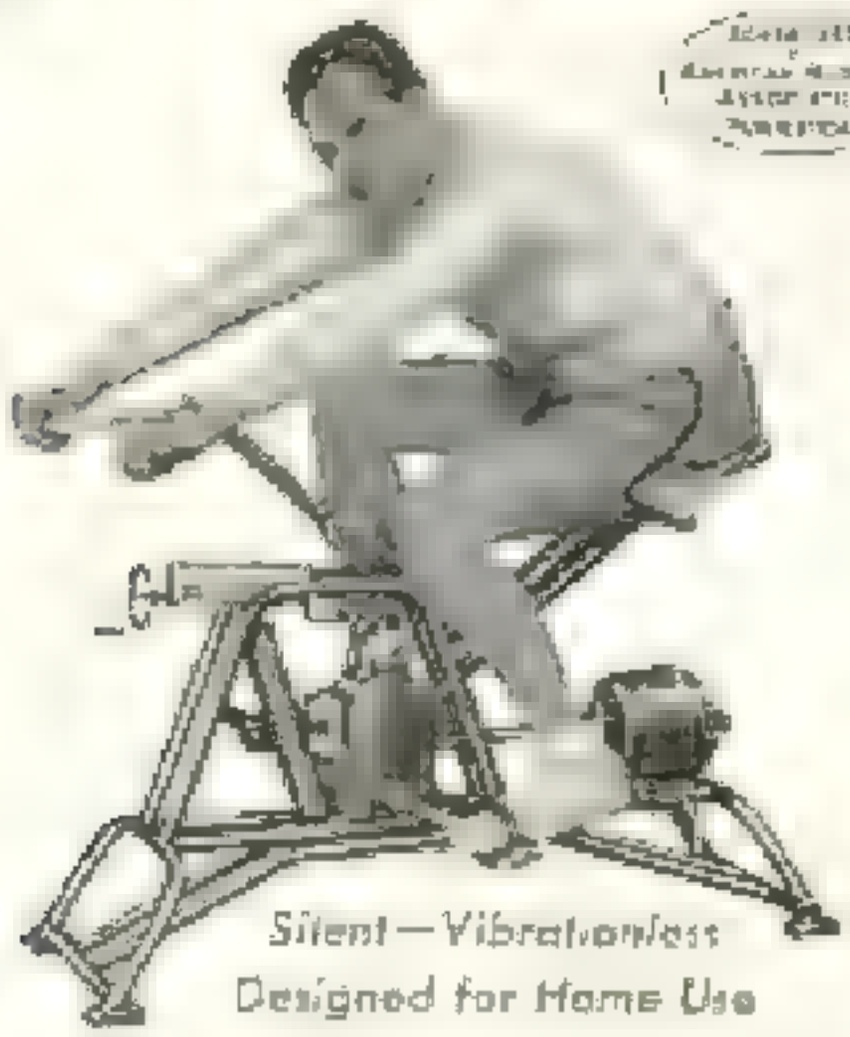
The reclining-chair comfort of the modern Greyhound bus is unequaled. But it is especially good to know that one of the world's best and safest drivers is at the wheel, competent in any kind of traffic and in any weather, ready to take you quickly to city or farm, across the county or the continent—even into neighboring Canada or Mexico.

The cost? Much less than driving your own car, much lower than other kinds of public transportation. *Relax with Greyhound next time you take a trip!*

Transportation for ALL the Nation

GREYHOUND

ACTION
of the body muscles
keeps the body fit
the EXERCYCLE* way



Many doctors use EXERCYCLE and have written to us that they have found this method the easiest and most pleasant aid in reducing weight. This revolutionary exerciser is electrically operated. Just get on...turn the switch, and you automatically get the beneficial actions of horseback riding, bicycling, rowing, swimming, separately or in combination, to suit your need or mood, in the privacy and comfort of your own home. Ideal for husband and wife. A few minutes a day is all you need. Send for interesting free booklet. *Reg. U. S. Pat. Off.

Helps correct intestinal discomforts caused by sedentary work.

MAIL COUPON

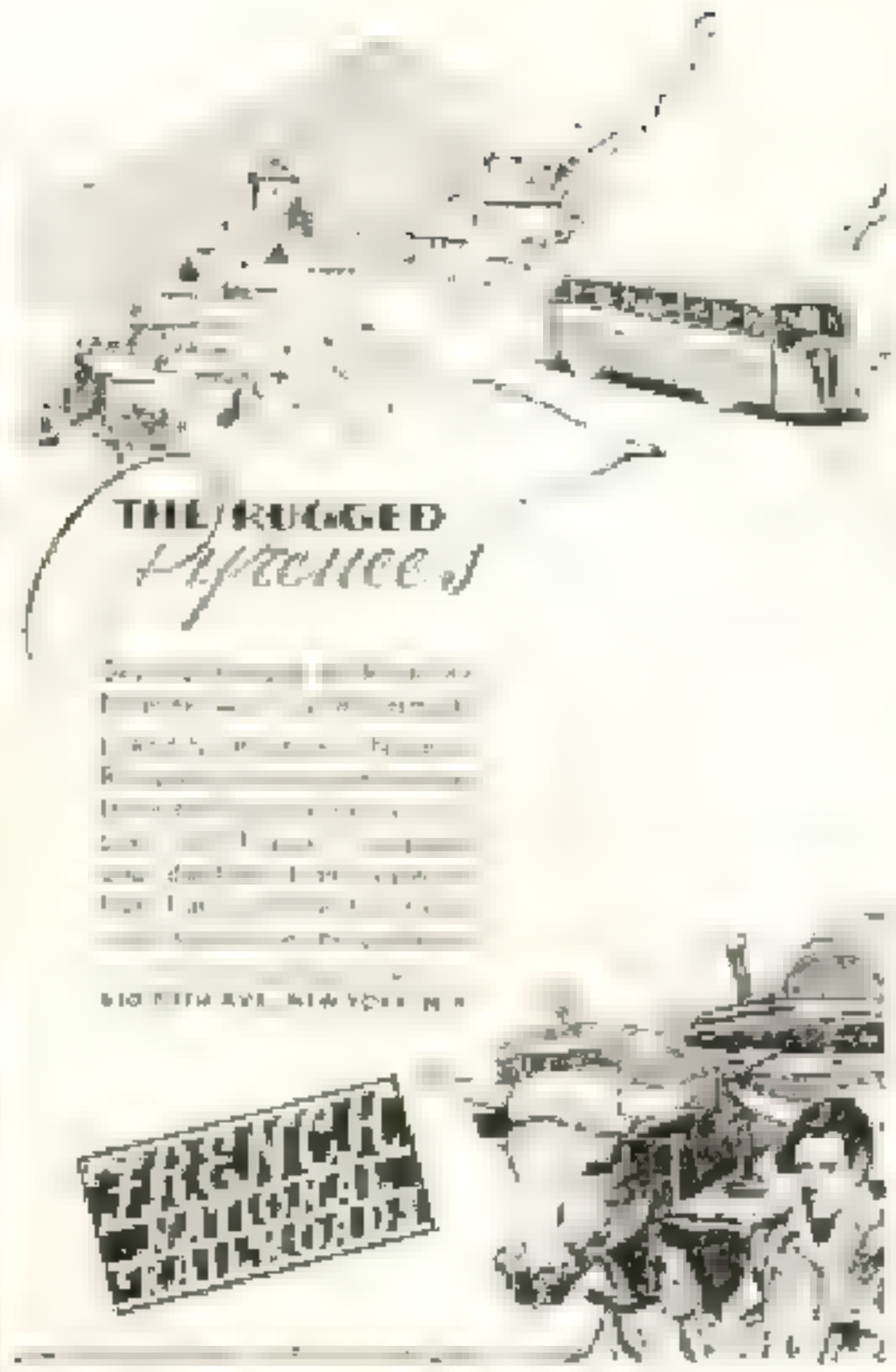
EXERCYCLE CORPORATION
597 Fifth Ave., New York 17, N. Y.

Please send me your illustrated literature free.

Name _____

Address _____

City _____ Zone _____ State _____



MEET A MAN WITH HIGH BLOOD PRESSURE

1. Everybody has blood pressure. It goes up every time your heart beats, down when your heart rests. The doctor discovered that the level of this man's blood pressure stayed high most of the time. He had high blood pressure type [illegible]

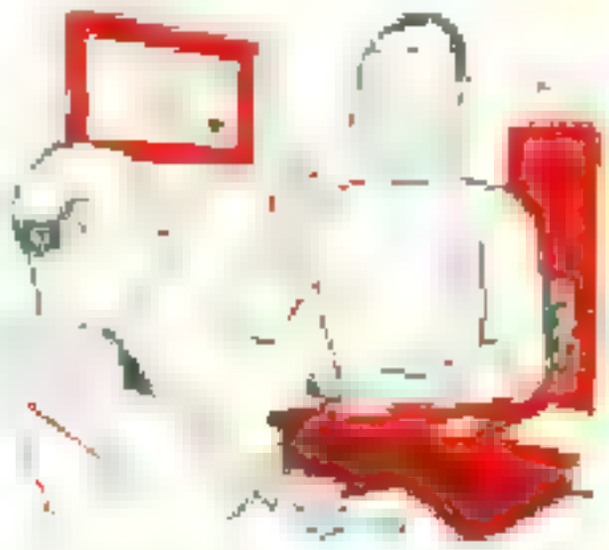
2. His heart had to work harder to circulate his blood. This extra strain often enlarges the heart [illegible] Arteries [illegible] blood [illegible] allowed [illegible]

3. However, [illegible] examination, [illegible] that, like most [illegible] pressure patients today, he could do a lot to help himself.

4. By taking his doctor's advice, he learned how to live with his ailment. He slowed down at work and play, he got plenty of sleep and rest.

5. He followed his doctor's [illegible] instructions about diet, so that his food might help [illegible] run, and avoid putting [illegible] strain on his heart.

6. He brought his weight down to normal and kept it there. For blood pressure often rises and falls as we put on and take off weight.



7. He saw his doctor for frequent check-ups. With good [illegible] many happy, useful years.

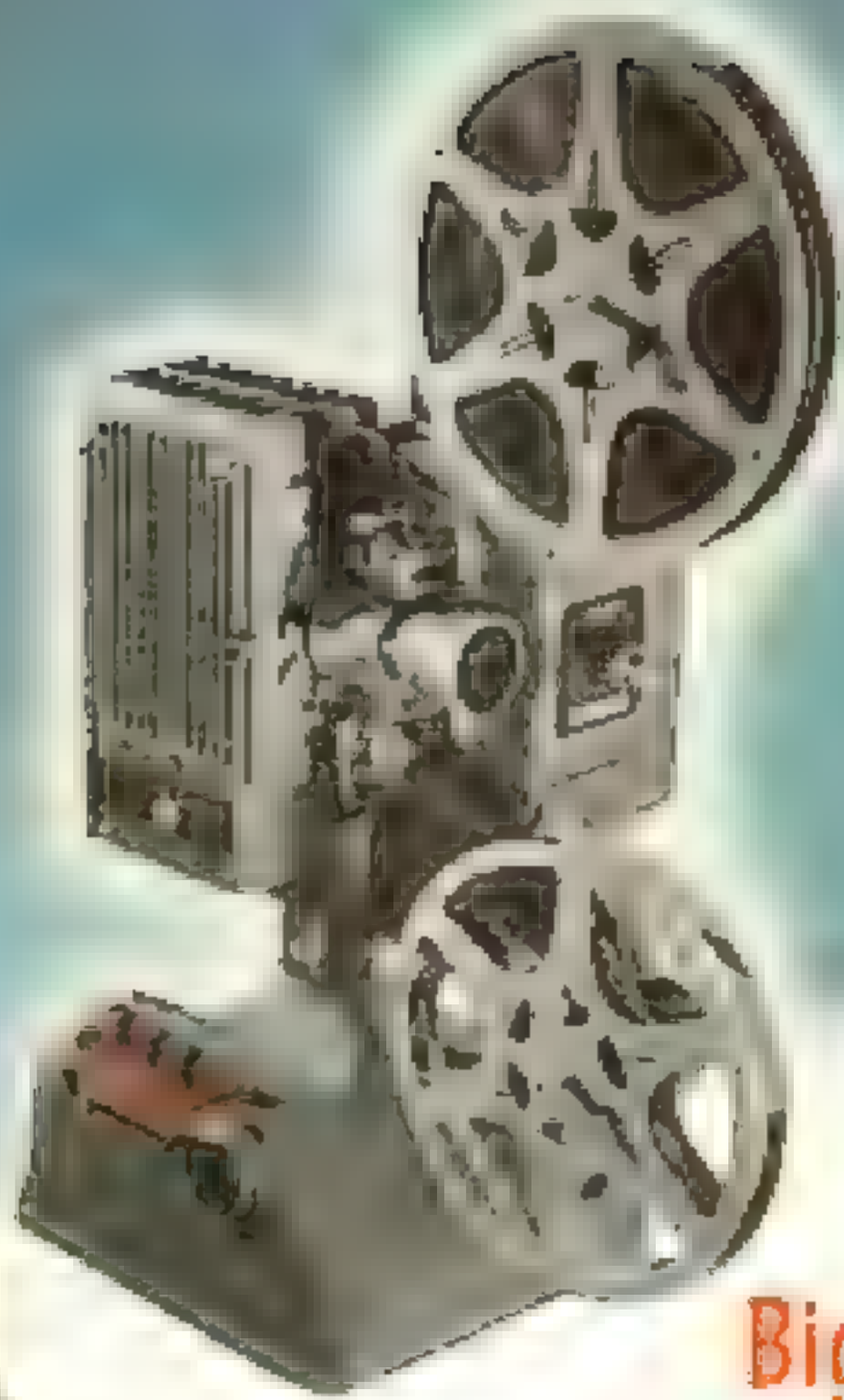
There is real hope that future advances of medical science will provide still more effective means of combating high blood pressure. Meanwhile, research is being aided by the Life Insurance Medical Research Fund, supported by the Life Insurance Companies, which makes grants for special research in diseases of the heart and arteries, including high blood pressure.

For further information about high blood pressure, send for Metropolitan's free booklet 108N, "Your Heart

Metropolitan Life Insurance Company

TO VETERANS—IF YOU HAVE NATIONAL SERVICE LIFE INSURANCE—KEEP IT!


WALLACE
STERLING



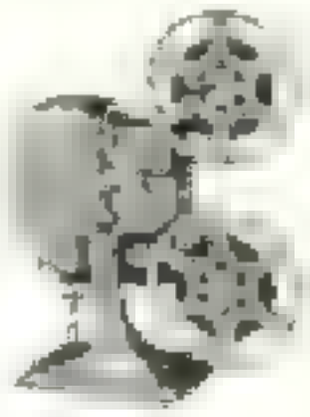
Travel movies...
Big–Brilliant–Effortless
showings with

Kodascope Sixteen-20 Projector

A button starts the motor . . . another turns on the lamp . . . your movies snap on the screen with almost magic brilliance. You're off to a flying start, and the illuminated push-button panel helps keep things under finger-tip control.

With Kodascope Sixteen-20 Projector showings are always right . . . always bright. It takes any of five *Ektanar* lenses . . . any of four lamps . . . so that you can "tailor" screen size and brilliance to audience size. Living room or spacious auditorium—it's always a good show!

With *f* 1.6 lens, 750-watt lamp, Cordomatic reel, and carrying case, Kodascope Sixteen-20 Projector is priced at $345. See this finest of silent 16mm. projectors at your Kodak dealer's. **EASTMAN KODAK COMPANY, Rochester 4, N. Y.**



Prices subject to change without notice

Kodak

THROUGH OCTOBER'S *carnival of colors*

Your springs will come to meet the [illegible] scarlet and golds of a Pennsylvania autumn. You will harvest soul-deep serenity which [illegible] the beauty of our fertile farms.

Here [illegible] like concrete [illegible]—is the [illegible] rewards of improved roads in [illegible]. We are glad this is so because it means [illegible] more and greater safety [illegible] motoring pleasure.

Here for your [illegible] are 10,000 miles of hard surfaced roads [illegible] cities [illegible] towns [illegible] thriving business [illegible] shaded [illegible] highways are [illegible] equal [illegible] in any other state in the [illegible]. Here are vast State Parks and forest areas [illegible] natural wonders [illegible] resorts [illegible] good living. You will enjoy Pennsylvania—the [illegible] state to see [illegible] the nation—the easiest [illegible] to reach [illegible] the [illegible].

Pennsylvania [illegible]

IF YOU DRIVE—DRIVE SAFELY

PENNSYLVANIA
FOR A "NATIONAL" VACATION

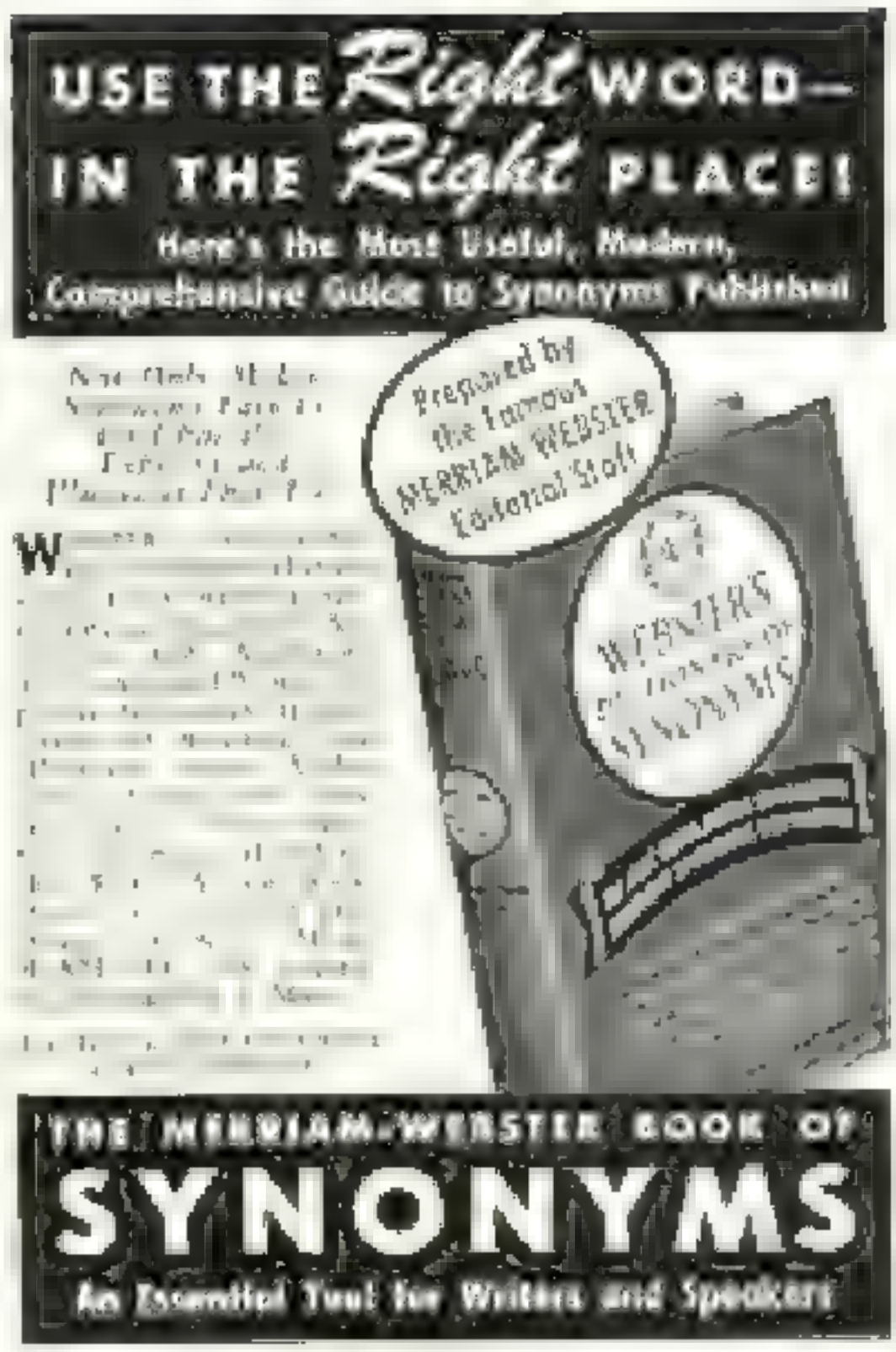
[illegible]
JAMES H. DUFF, Governor
ORIS P. MATTHEWS, Secretary of Commerce [illegible]

Pennsylvania Department of Commerce, Harrisburg
(Please send [illegible] booklet Pennsylvania [illegible])

Name _____

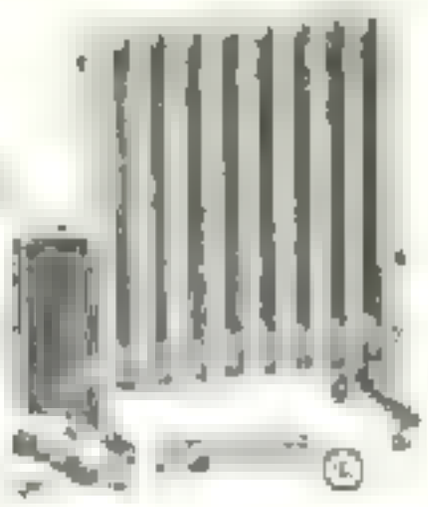
Address _____

City _____ State _____



Warm Up THAT COLD GUEST ROOM!

. . . with a BURNHAM PORTABLE
Electric Steam Radiator



Here's the [illegible] economical way to provide the extra heat [illegible] needed in upstairs bedrooms [illegible] by an [illegible] Burnham PORTABLE Electric Steam Radiator. A complete [illegible] fully automatic heating unit. [illegible] Clean Clean [illegible] 60" or 80" $55 to $65 F.O.B. Factory. [illegible] Coupon [illegible]

A. Sentinel Light—[illegible]
B. 2 Way Thermostatic Control [illegible]
C. Extend Heating Element [illegible]

Ideal For
Bedrooms — Sick Rooms
Bathrooms — Sun Porches
Camps
or any room where you need quick, extra heat

Burnham Corporation, Electric Division Dept. [illegible]
[illegible]
Please send [illegible]
Name _____
Address _____

The vacation you promised yourself

. . . the luxury of a superb cruise liner

. . . the glamour of

South America

Here again the 33,000-ton liners of Moore-McCormack's Good Neighbor Fleet, completely rebuilt and restyled, sail south across the Equator to the wonderlands of Brazil, Uruguay and Argentina. Every comfort awaits the traveler: gay cruise parties . . . outdoor tiled swimming pools surrounded by broad sports decks . . . a distinguished American cuisine . . . air-conditioned dining salons . . . spacious public rooms . . . all state rooms outside, many with private bath or shower. Here are splendid ships—operating to ports exotically beautiful!

S.S. BRAZIL • S.S. URUGUAY • S.S. ARGENTINA

sailing Fortnightly from New York

38-DAY CRUISES

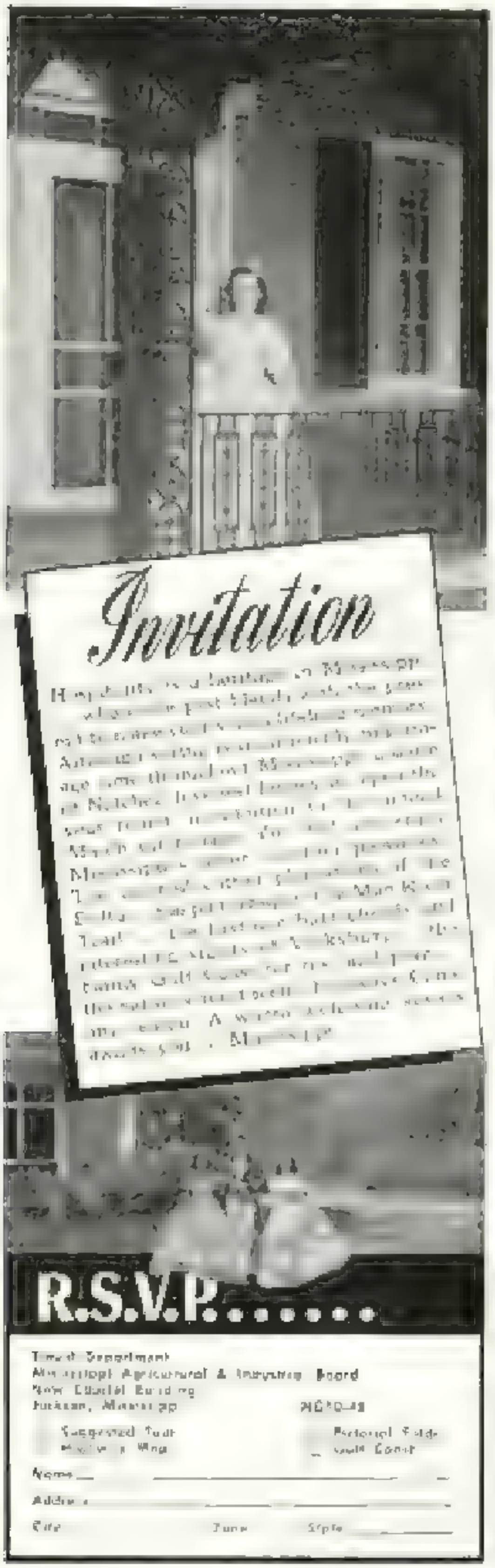
to RIO ☆ SANTOS ☆ SAO PAULO

MONTEVIDEO ☆ BUENOS AIRES ☆ TRINIDAD

For information consult
your Authorized Travel Agent or

MOORE-McCORMACK Lines

5 Broadway New York 4



Motorola TELEVISION

your complete *Living Room Theatre*

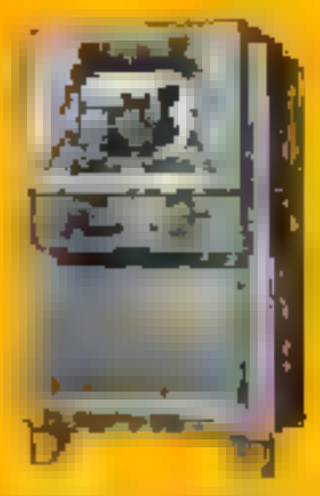
in one gorgeous cabinet

6 in ONE

1 TELEVISION on a big screen
2 AUTOMATIC PHONOGRAPH for new Long Playing records
3 AUTOMATIC PHONOGRAPH for standard records
4 FM RADIO (Frequency Modulation)
5 AM RADIO (Standard Broadcast)
6 ROOMY RECORD STORAGE SPACE

Make no mistake — [illegible] but see for yourself. Compare the [illegible] brightness of Motorola Television with any other at any price. Compare the Golden Voice [illegible] of Motorola FM and AM radio — the same [illegible] reproduction. [illegible] Compare the generous record storage space. Then, [illegible] Furniture Styled beauty of this [illegible] in your own home. Just [illegible] compare — and you'll never be satisfied with any other.

MODEL VF303



Television Console [illegible]

Gorgeous Table Model [illegible]

Wonderful Television [illegible]

Thrilling Beauty [illegible]

Flavorama Jr. [illegible]

Table Radio-Phonograph [illegible]

So Much For So Little [illegible]

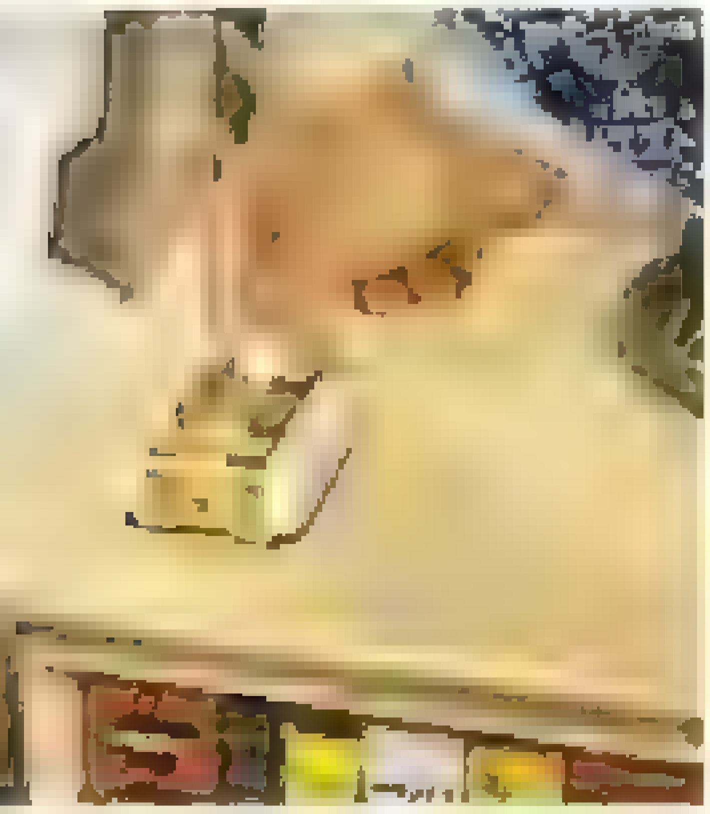
MOTOROLA INC. • CHICAGO 51, ILLINOIS

"Never Slept Better!" agree the Linkletters of Hollywood,

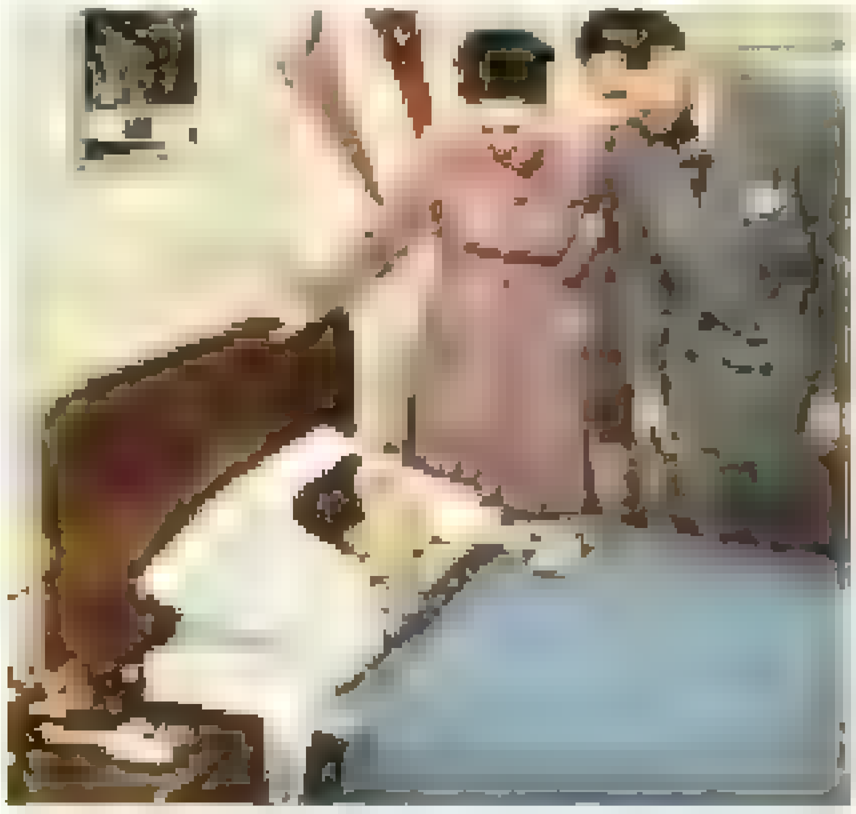
plauding General Electric's AUTOMATIC SLEEPING COMFORT

[illegible] of that popular [illegible], "The G-E House Party," Art Linkletter often presents Automatic Blankets [illegible] "No more chills, wakeful nights!" [illegible] "This one light blanket keeps [illegible] from bedtime to breakfast!"

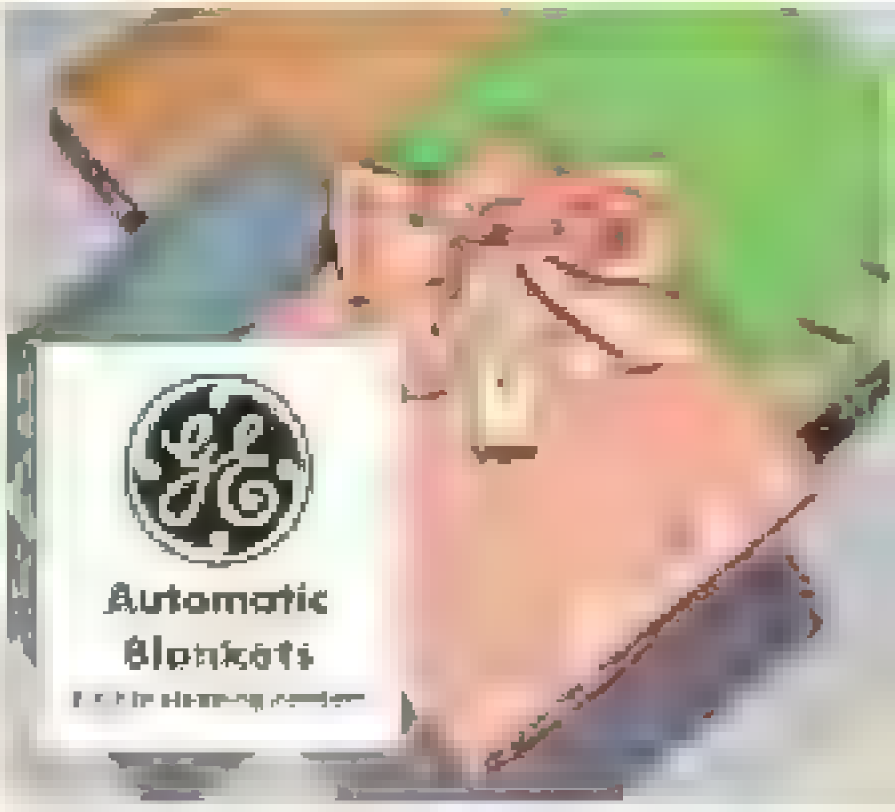
1. **Says Art Linkletter to Mrs. Linkletter:** "I'm sure General Electric's Two-control Blanket has added years to our marriage! Now there's no need to argue over covers. The blanket has two controls—one for each half—that function independently. Mr. Linkletter selects his favorite sleeping temperature. Mrs. Linkletter selects hers."



his small, compact Bedside Con-ol does the [illegible] [illegible] Automatic [illegible] eeping Comfort!



3. **"Cozy dreams,"** say the Linkletters. (Note G-E's special Twin-bed Blanket.) ONE G-E Blanket [illegible] than 3 pounds [illegible] the place of THREE ordinary blankets [illegible] launders [illegible] according to American Institute of Laundering.



4. **Rose, cedar, green, blue.** One- and Two-control models. Sizes for twin, [illegible] beds. Operating cost, less than [illegible] a night, [illegible] electric [illegible] department stores. General Electric Company, Bridgeport 2, Conn.

"For more G-E facts—and fun, too—" invites Art Linkletter, "[illegible] 'The G-E House Party.' Monday through Friday, [illegible] CBS."

[illegible]

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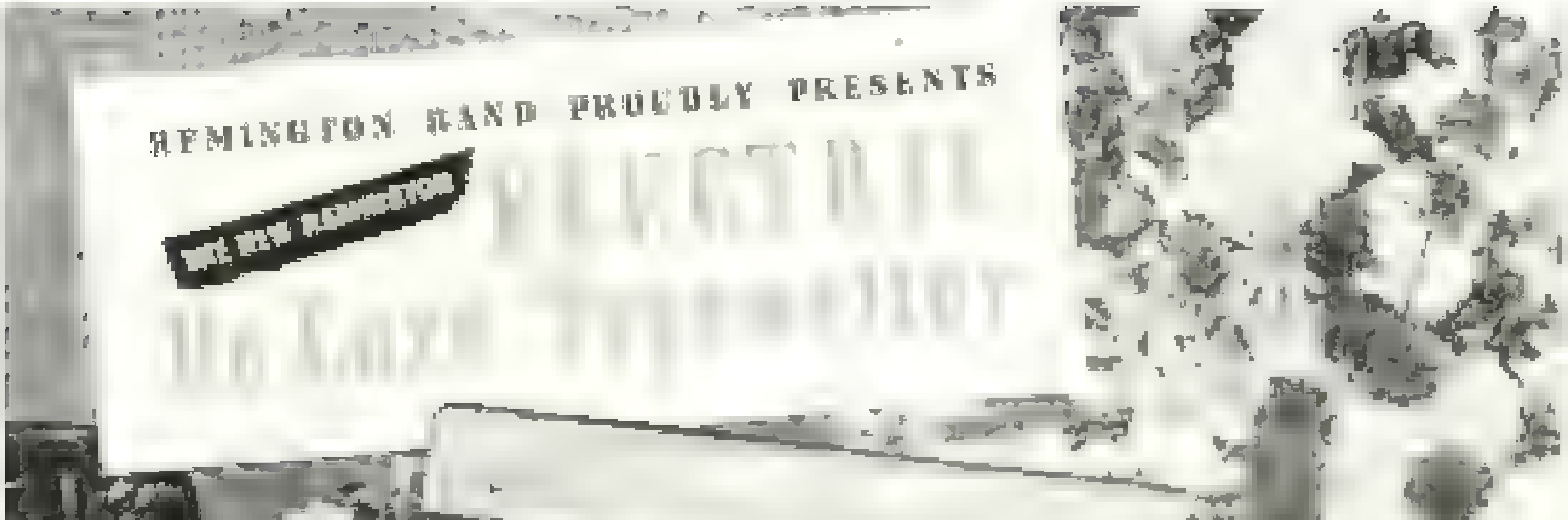

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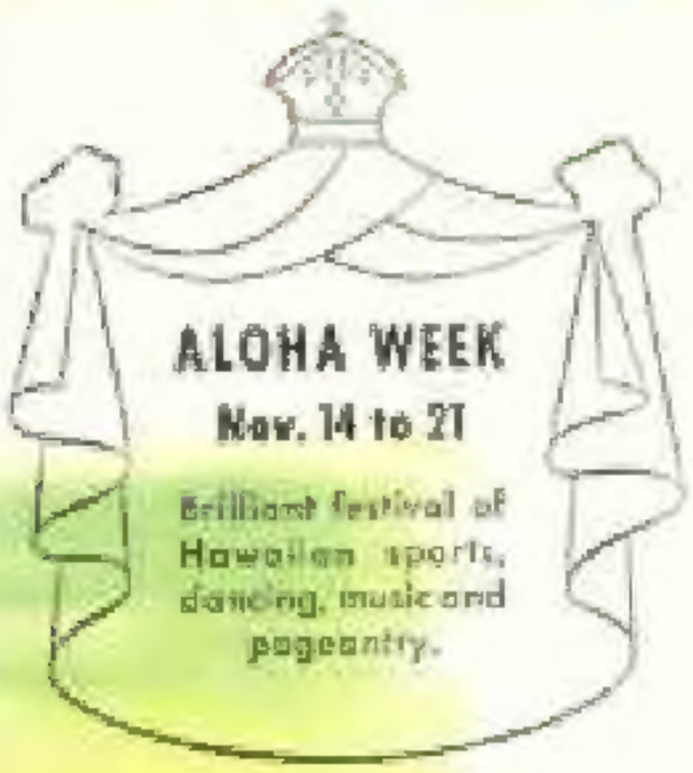

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